THEORY STUDIES: CONTEMPORARY ARCHETYPICAL PRACTICES OF TRANSFORMATIVE INTERIOR DESIGN

A Thesis

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Master of Arts

by

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ABSTRACT

Many sources dedicated to transformative objects and interior spaces focused solely on the documentation and illustration of an individual project. Little research provided an interpretative perspective on the development of the transformative interior that spans time and cross-cultural boundaries. This thesis is a theoretical study establishing design vocabularies that identify transformative qualities of interior practices derived from contemporary examples within a historical continuum.

Based on the theoretical, methodological, and philosophical approach established by Jan Jennings and George Kubler's premise, *Shape of Time*, this study contributes to a continuing body of research known as the Intypes (Interior Archetypes) Research and Teaching Project at Cornell University. The framework is based on typology, investigating the reoccurrence of metamorphic qualities in design practice. The Transformative Interior Intypes will be published both in print and online at *intypes.cornell.edu*, and will serve as a pedagogical tool for design educators and students in learning contemporary design history.

Interior Archetypes, also known as Intypes, were developed by characterizing photographic examples collected from prominent architectural and interior design journals as well as relevant secondary sources. Four Intypes were identified, each with distinctive transformative quality and a collection of precedent design influences and technological advancements. Transformative Intypes involving manual motions were interpreted by the hardware action

required to cause the transformation, such as Fold and Pivot. For the electrically transformative Intypes, Chameleon and Pulsate, spatial effects and psychological implications were characterized. The analysis and findings were substantiated by detailed graphic analysis on the basis of data gathered through primary and secondary sources.

Furthermore, the linear organization of photographic examples of interiors in a timeline format was produced to communicate visual representation of reiterative practices. Illustrations visually represent the evolution and variations within each Intype. In conclusion, the overall interpretation of contemporary Transformative Interiors summarizes concepts developed in this thesis and provides a paradigm for future assessment.

BIOGRAPHICAL SKETCH

Elizabeth Erin Lee was born in Iowa City, Iowa in March 6, 1984. She earned her Bachelor of Science degree in Design Environmental Analysis, Interior Design from the School of Human Ecology, Cornell University in 2007. Having gained professional commercial interior design experiences through prominent architecture and interior design firms, Erin wants to become a design consultant and educator.

ACKNOWLEDGMENTS

I am very fortunate to have had the opportunity to work closely with Professor Kathleen Gibson as both undergraduate and graduate student. Her expertise in digital media related to interior design inspired me in the conception of this thesis. She also has helped me to critically evaluate design issues and substantiate design theories presented in this thesis.

I am also grateful for Professor Fernandez who enlightened me in the realm of digital art, and made it possible to make connections between interior design and kinetic art. She changed my way of perceiving technology and art. I am also grateful for Professor Jan Jennings who provided me with an analytical understanding of design and design research.

I extend my gratitude toward Professor Horrigan and Professor E.D. Intemann, who gave insightful suggestions and recommendations during the process of naming of each Intype. I would also like to thank the Department of Design and Environmental Analysis and the College of Human Ecology for financially supporting my research endeavor.

Lastly, I want to express my eternal gratitude towards my family, especially my dear sister Sarolta Vivian Lee. Without their support and encouragement, I would have not been able to complete this accomplishment.

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CHAPTER 1 Research Basis

1.1 Premise

The Definition of Transformative Interior Space

A *Transformative Interior* is responsive to occupants' functional needs, aesthetic demands, or environmental factors which may lie beyond the interior perimeter. Tangible changes are exemplified by adaption through interior surfaces, volumetric space or ambient qualities such as lighting and sound. Thus, one of the key characteristics of a *Transformative Interior* is its dynamic condition affecting spatial usage and perceived qualities. This definition has been established by Elizabeth Erin Lee to serve as a premise for the formation and categorization of data gathered for this study.

Interior designers often approach design as a solution to a set of problems in a given context. Transformative Interior practices can be seen as a response to daily occurrences which challenge individuals and society. The need for space maximization and more effective use of space has escalated due to increasing populations and a fixed quantity of habitable land. In 2006, more than 50 percent of human beings worldwide live in an urban setting.[1] For these city dwellers space has become a luxury. Wide variation among countries and their population has been studied and recorded. In an island country such as Japan, space maximization as a design strategy is essential and culturally acceptable. Needless to say, growing stressors and demands will require

[1] United Nations Population Division, World Urbanization Prospects 2005 (New York: 2006)

creative design approaches to achieve flexibility of the built environment. Maximizing space utilization is also becoming valuable in terms of sustainability. Effective usage not only conserves square footage of the physical space, but also energy and costs associated with constructing and maintaining buildings. For example a multi-functional space with flexible design which can easily be modified eliminates the need to create several subsequent spaces.

Conversely, various interconnected social trends have triggered the need for spatial dynamism. Mass production of industrial products has led to public demand for customization and personalization against duplication and a homogeneous appearance. Dissent led to the demand for branding of interior spaces where spatial dynamism provided a unique and customized interior experience.

'Information as currency' triggered the need for effective communication among the extensive quantity of available information. Delivering meaningful information to a targeted audience has become a competitive edge, and the spatially dynamic interior has become a means of communication. For example, wall monitors display the stock market, weather, or the latest fashion. The interior becomes the channel of communication for layers of information. Versatility and temporality of modern life style also creates a demand for an ever-changing sensory experience provided by the interior.

The difference between the two kinds of transformative interior architecture can be associated with the idea of De-formation and In-formation as

postulated by Pongratz and Perbellini. De-formation refers to “a generative system that is dynamic organization in the sense that it is self-modifying and organizing, with an infinite potential for differentiation.”[2] Mechanically transformative interiors offer a variety of settings initiated by occupants using automated components in the interior. The configuration of interior changes or de-forms to accommodate more than one interior scheme, often serve different functional needs. Alternatively, In-formation refers to “a coded layering of elements, such as function, text, shape, material and sign form, that together form a dynamic environment.”[3] Electronically transformative interior spaces generally fall into this category because essentially, they utilize electric components and the digital surface to convey different pieces of information through movement of light and energy.

I developed a total of four Intypes – Stow, Pivot, Chameleon, and Pulsate (Figure 1.1.1). Stow and Pivot are Intypes are characterized by the mechanically transformative interior while Chameleon and Pulsate fall under the category of electronically transformative interiors. The classification of Intypes was made on the basis of the Transformative Interior definition established in this thesis, as well as specific motions and mechanisms each InType required.

[2] Christian Pongratz and Maria Rita Perbellini *Natural Born CAADESIGNERS* (Basel, Switzerland: Birkhauser, 2000), 35.
[3] Christian Pongratz and Maria Rita Perbellini *Natural Born CAADESIGNERS* (Basel, Switzerland: Birkhauser, 2000), 60.

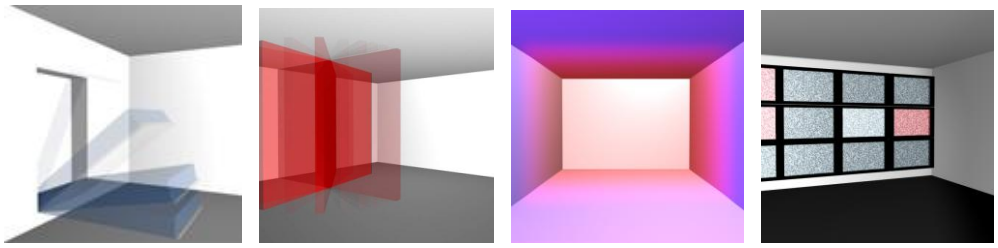


Figure 1.1.1 Four transformative intypes from left to right. Stow, Pivot, Chameleon, and Pulsate.

1.2 Interior Archetypes Research and Teaching Project

This thesis will be part of the Interior Archetypes (Intypes) Research and Teaching Project, a web-based learning site developed by Professor Jan Jennings and Kathleen Gibson, and their graduate students. The Intypes Project, initiated in 1997 at Cornell University, creates "a typology of contemporary interior design practices that are derived from reiterative historical designs that span time and style and cross cultural boundaries".[4]

Intypes project started in 1997 to establish and disseminate interior design-specific vocabulary that can be applied when discussing about contemporary design practices. Led by Professor Jan Jennings, Kathleen Gibson and their graduate students, there have been over one hundred Intypes developed. Based on well established premise and research method, Intypes name and examine interior design practices that have not been identified before. Fulfilling its pedagogical purpose, all research is available online in form of a searchable database. Each Intype is showcased with an icon and research as well as pictorial timeline. Together, the body of research covers various types of interior spaces and elements, such as residential, hospitality, retail, color

[4] Jennings, Jan. "A Case for Typology: The Interior Archetype Project". Journal of Interior Design. 2006.

and artificial lighting. Each year, Intypes are being expanded by graduate students in an area of their interest. This thesis will contribute to the Intypes Project by studying transformative interior spaces. The website www.intypes.cornell.edu was launched August 2009 with full public access (Figure 1.2.1).

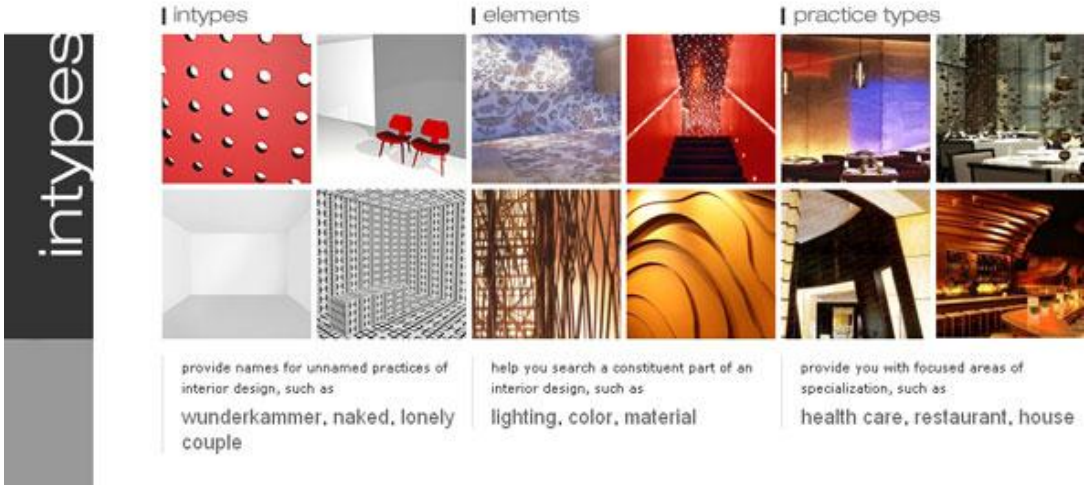


Figure 1.2.1 Home page of the Intypes Research and Teaching Project website at www.intypes.cornell.edu

1.3 Methodological Approach and Process

An archetype in interior design practice can be thought of as an organized body of knowledge. To discover that body of knowledge I undertook a series of seven phases developed by Professor Jan Jennings in "A Case for Typology of Design: The Interior Archetype Project," from the *Journal of Interior Design* (2006); [5]

1) Perform a content review and analysis of design journals such as *Architectural Record*, *Interior Design*, and *Interiors* (primary sources) and secondary source materials such as a literature categorized under

[5] Jennings, Jan. "A Case for Typology: The Interior Archetype Project". Journal of Interior Design. 2006.

the topics of Kinetics, Transformational space, Responsive Environment, and Flexible Space.

2) Identify composites of traits that typify (through time) a dominant characteristic that has been used repeatedly by designers as interior architecture or design;

3) Isolate these traits by naming and defining them and illustrating examples chronologically; also compared with relevant historical, social and technological occurrences.

4) Conduct an on-site field study to various cities to confirm the identified traits in step three and gather further technological insights and background of Archetypes developed;

5) Outline preliminary development and proposal of specific Archetypes;

6) Revise the Archetypes based on observational evidence;

7) Present the InTypes in the web-based format.

All steps were conducted by myself as the primary researcher. During step three, the Intypes Committee, comprised of fellow graduate students and participating professors from departments of Landscape Architecture and Theater , were heavily involved in proposing and testing appropriate names for each Intype.

1.3.1 Content Survey

The content survey of architectural and interior design trade journals included the period from 1930 to the present. I examined 1,000 issues of *Interior Design* published within the last eighty years. I also examined a selective number of *Architectural Record* and *Interiors* published within the last thirty years, totaling 720 issues. The content survey was further enhanced by findings from trade books that specialized in various aspects of interior design. The content survey became the basis of constructing a timeline of each Intype.

1.3.2 Analysis and Interpretation

The primary method to discover a sequential design strategy was to look for recurrent design typology that can be considered an Intype. Visual study of thousands of photographs of interiors was the first step to establish data from which categorizations were made. This method of data gathering is referred to as “Visual Note Taking,” which is a process of drawing out elements on trace, looking at specific elements (spatial quality) at a time. When there is a recurrent element, those photographs can be grouped to become an Intype. The challenge in evaluating photographs in terms of transformative interiors was the limitation of still photography. Because photographs do not incorporate time as a factor, further examination of the interior space and the written description was crucial. Examination of additional trade journals and secondary sources was a subsequent step, which revealed the transformative quality of an interior in more depth. Once traits were identified from the visual study of photographs, I isolated the collection, and presented my findings to the Intype research committee to be accepted as an Intype. Site visits in New York City and communication with the owners and architects of specific buildings further revealed qualities of spaces undetected from trade sources.

The framework of Transformative Interior Intypes was based on George Kubler’s book, The Shape of Time. The very definition of an Intype comes from Kubler’s idea that a piece of art (or design) is part of a sequence of similar artistic events occurring and recurring over time. “An old and interesting art (design) is not unique, but its type exists in a variety of examples spread early and late in time, as well as high and low upon a scale of quality, in versions which are antitypes and derivatives, originals and copies,

transformations and variants."[6] Kubler claims that there is a "prime object," which serves as a starting point of a sequence of design practice, an InType. The subsequent examples of the prime object may be replication, derivative, or elaboration of the original concept. Together they form a sequence which share similar qualities.

Kubler believed that "every important work of art (design) was considered both as historical event and as a hard-won solution to some problem."[7] This statement is relevant in examining interior design practice in term of history of things. At the same time, archetypes are design solutions to various demands of our society. Transformative Intypes presented in this thesis demonstrate the solutions to problems of spatial limitation within interior design practice. Each Intype is a strategy that has been practiced over decades that alleviate spatial limitations and demands. For example, Stow is a solution to the problems associated with visual disorder and the ongoing reduction of occupiable space.

[6] George Kubler, Shape of Time: Remarks on the History of Things. (New Haven: Yale University Press, 1962), 30.
[7] Ibid.

CHAPTER 2 Review of Literature

Based on the methodological protocol of the Interior Archetype Project, the body of research depends on the comprehensive survey of primary sources and selective consultation of secondary sources. The following list covers all sources that were essential during data collection and analysis.

Primary source refers to the first-hand documentation of an architectural / interior space usually in words and photographs published in major design trade journals. Secondary source refers to literature dedicated to a specific topic, usually organized by chronological order or topical categories.

2.1 Primary Sources

The content survey involved examination of primary sources. I examined all issues of *Interior Design* published from 1930s to present. Selected issues of *Architectural Record, Interiors, Architecture*, and *Metropolis* were also reviewed. Patent records of transformative devices and spaces also served as a source of primary data. Exhibition catalogs and similar literatures that focus on transformative interiors were consulted and served as primary sources:

Emilio Ambasz, *Italy: The New Domestic Landscape* (New York, The Museum of Modern Art: 1972) is a review of an exhibition held at the Museum of Modern Art in 1972 under the same title. A number of Italian designers such as Joe Colombo, Achille Castiglioni, and Ettore Sottsass were asked “to explore the domestic landscape with a sense of its ‘place’ with special attention given to the individual’s need for spaces both adaptable and fixed

nature."[8] Ideas from this exhibition reflect Italian modernism of the time – speculative furniture and installations about flexible living.

For strategies to maximize space with flexible features, see Jane Graining, *Compact Living* (Britain, Octopus Publishing: 1999) and Amanda Lam and Amy Thomas, *Convertible Houses* (Utah, Gibbs Smith: 2007). With tangible examples throughout the world, usually from densely populated areas, this book featured various methods to save space which were conveyed with comprehensive floor plans and detailed images. Projects featuring residential studios and apartments were categorized by domestic functions such as dining, entertaining, sleeping, and working.

Jennifer Hudson, *Interior Architecture Now* (London, Laurence King Publishing Ltd: 2007) is a collection of cutting-edge interior works of fifty-five celebrated designers. Rather than a comprehensive survey, the author delivers both the firmly established and the more experimental interiors. The source provides diverse directions in which designers are taking in terms of transformative interiors.

<u>Prominent Designers Motivated by Transformative Concepts</u>

For Review of Nam June Paik's (1932-2006) major video art works, see Wulf Herzogenrath et al, *Nam June Paik: Video Works 1963-88* (London, Hayward Gallery: 1988). Based on the Paik's work for the exhibition at Hayward gallery in 1988, you can get various interpretive perspectives and photographs of

[8] Emilio Ambasz Italy: The New Domestic Landscape (New York, The Museum of Modern Art: 1972) 21.

Paik's work during his most creative period. Paik was the first artist to use a monitor as a medium. His sculptures not only "animates the otherwise merely passive spectator,"[9] but also the space itself with dynamic images. This reference offered helpful guide to understanding the archetypical practice of Pulsate, which was shaped by grasping the Paik's idea during his most creative period.

Furniture Design in Special Focus

George Nelson, *Storage* (New York: Whitney Publications, Inc., 1954) offer examples of modern furniture and specific solutions for domestic storage. Nelson's design is a solution to the lack of storage space triggered by mass consumerism of 20th century.

Small Space Living

Organized by size, Marisa Bartolucci, *Living Large in Small Spaces* (New York: Harry N. Abrams, Inc. Publishers, 2003) features wide range of small space living solutions predominantly in residential in New York City, where real estate value is higher than other metropolitan cities. Ranging from dorm rooms to a large apartment, the book provides unique strategies for every size.

Traditional Japanese designs are fundamentally flexible and versatile, using shoji, the sliding screens to divide one-room houses. Michael Freeman, *Space: Japanese Design Solutions for Compact Living* (New York: Michael

[9] Wulf Herzogenrath et al., *Nam June Paik* (London: Hayward South Bank Board, 1988), 6.

Freeman, 2004) enlightens the reader with unique approach that tailors to the conditions and requirements of each building and the owner.

2.2 Secondary Sources

Light and Space

To grasp an in-depth understanding of the relationship between light and architecture, see the book by Mark Major, Jonathan Speirs, and Anthony Tischhauser, *Made of Light: The Art of Light and Architecture* (Basel, Switzerland: Birkhauser, 2005). Divided into twelve chapters that explore essential aspects of light and architecture: Source, Contrast, Surface, Color, Function, Form, Space, Image, Movement, Boundary, and Scale, Major, et al. provides a comprehensive overview of the role light plays in architecture from past, present, and future.

Color and Space

To comprehend the properties of color and its usage in design, see Robert F. Ladau, Brent K. Smith, and Jennifer Place, *Color in Interior Design and Architecture* (New York, Van Nostrand Reinhold: 1989).

Chronological History of Furniture

Various approaches are employed to write about the history of furniture. Franklin H. Gottshall, *Period Furniture: Design and Construction* (New York: Bonanza Books, 1937) gives an insight into period furniture, with illustrations of details that define the style of the era.

Organized in alphabetical order, Joseph Aronson in *The Encyclopedia of Furniture* (New York: Crown Publishers, 1944) defines a wide range of furniture related terminology supported with line drawings and black and white photographs.

For a history of furniture from a Western point of view, see Louise Ade Boger, *Furniture Past & Present* (New York: Doubleday & Company, Inc., 1966) This book covers is a historical record of prominent furniture styles influenced during each time period from Ancient Greek and Roman Empire to Renaissance, European royalty styles, leading to Modern Movement.

For a discussion of furniture design based on social aspects, see John Gloag, *A Social History of Furniture Design from B.C. 1300 to A.D. 1960* (New York: Crown Publishers Inc., 1966) Social habits and rituals influence the design and production of furniture across time. Gloag provides history of the use of western furniture in social setting from ancient time to the 19th century.

From Peter Phillips, *Furniture of the World* (London: Octopus Books Limited, 1974), one discovers large color photographs of furniture accompanied by the archetypical development of each major classification, such as bed, seat, chest, and cupboard. The author briefly includes essays on the use of materials and the history of cabinetry.

To understand the history of modern furniture in context of “Industrial Revolution and social change, emergence of a new social stratum,” see Karl Mang, *History of Modern Furniture* (Stuttgart, Verlag Gerd Hatje: 1978). From

the late 19th century to the 1970s, Mang touches on major aesthetic movements in design history and describes notable pieces of furniture and designers who contributed to these movements.

Several literatures especially focus on the 20th century when the field of interior design became known. Anne Massey, *Interior Design of the 20th Century* (London: Thames and Hudson Ltd., 1990) introduces all the styles, provides guide to the changes of direction, and fully documents the emergence of professional "interior decoration" and its evolution into interior design.[10]

Furniture Design in Special Focus

For history of objects for traveling, especially luggage and trunks, see Deborah Shinn et al, *Bon Voyage: Design for Travel* (New York: The Smithsonian Institution, 1986). To sustain days on the train and ships, being compact was necessary. Chests and trunks were equipped with gadgets and ingenious ways of storing, often providing surface area for general activities.

Annie Carlano and Bobbie Sumberg *Sleeping around: The Bed from Antiquity to Now* (Sante Fe, New Mexico: Museum of International Folk Art, 2006) focuses on the culture and design related to sleeping from different cultures and over time. This book has been particularly helpful on the topic of sleeping furniture that can be stowed away like Murphy bed and Pullman cars.

[10] Anne Massey, *Interior Design of the 20th Century* (London: Thames and Hudson Ltd., 1990)

Prominent Designers Motivated by Transformative Concepts

Documentation of Joe Colombo's (1930–1971) career, from furniture pieces to interior design, can be seen in Ignazia Favata *Joe Colombo and Italian Design of the Sixties* (Cambridge, Massachusetts: The MIT Press, 1988) The book includes Colombo's original sketches and idea diagrams with author commentary. Joe Colombo being a herald figure in bringing modern Italian product design to International attention, the literature reveals the philosophical essence of transformative approach to living.

Eileen Gray's (1878 -1976) work from décor to architecture is illustrated in Caroline Constant, *Eileen Gray* (London: Phaidon Press Limited, 2000). From her sketches to final product, Eileen Gray's design process and context in which she was working in provides adequate background for understanding her work in regard to the 'machine age' living.

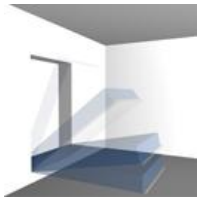
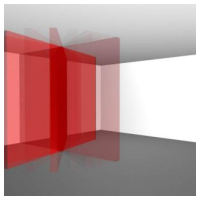
Japanese Design – Precedent of Transformative Interiors

See Tesuro Yoshida, *The Japanese House and Garden* (New York: Praeger Publishers, 1955) for understanding traditional Japanese houses. With historical background, floor plans and photographs of different types of traditional Japanese houses and construction methods, Yoshida provides a comprehensive overview of traditional Japanese domestic homes and gardens.

CHAPTER 3 Transformative Interior Intypes

The four Intypes – Stow, Pivot, Chameleon, and Pulsate are the typological and archetypical solutions to the technological advances and changing demands of modern lifestyles. The Intype name defines a theoretical concept for the transformation of interior space through the tracing of mechanism and technology over several decades. Each Intype was categorized on the basis of the specific motions and transformation resulting from those actions.

Transformational Technologies

Intype	Technology	Motion/Action	Element	Transformation
Stow 	Manual Mechanical	Open / Close Fold Push / Pull Lower / Raise	Wall Floor Ceiling Object	Hidden components/spaces/functions are revealed upon appropriate action
Pivot 	Manual Mechanical	Rotate Revolve Turn Swivel Spin	Wall Floor Building Object	Action enables circulation, access, multi-functional activity or changing views
Chameleon 	Electrical Digital	Advance Undulate	Wall Room	Constant change in color achieved through lighting. Furnishings and viewers in space are affected.
Pulsate 	Electrical Digital	Throb Beat Animate	Wall Floor	'Interior window' made up of a series of television screens or computer monitors that introduce stimulating imagery

Stow refers to a range of manual motions associated with revealing or concealing interior components in order to save space or to enable multiple functions. Actions activate otherwise static interior- fall, fold, push-pull, lower-raise, or a combination of actions reveal. Throughout my thesis, I examined how motions associated with revealing or concealing components, coupled with specialized hardware, transformed interior spaces within a range of scales.

Pivot refers to rotating, revolving or turning motions of a wall, a floor, or an entire building. The development of pivot can be divided into four categories; pivoting walls and vertical planes, pivoting casework, pivoting horizontal planes, and pivoting buildings. Walls, floors and structures are manually or mechanically activated to rotate, revolve, turn, swivel, and spin about a central axis.

Chameleon describes the transformation of an interior by manipulating and varying colored light over time on a single plane or incorporated throughout the entire spatial envelope. Control system and programmed by computers, Chameleon strives to constantly change the hue of a space.

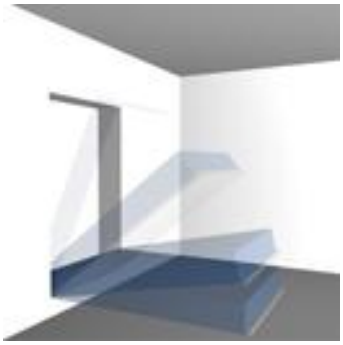
Pulsate describes a group of televisions or computer monitors that create a visually active and animated wall plane. By using TV monitors as a building block, the individual images became part of a total composition –ways of incorporating time as another dimension in the interior space. Electrical and digital images are shown in video format changing the interior landscape at any given time.

The following chapters are devoted to a comprehensive examination of the origins and series of discoveries, inventions, and design ideas spanning several decades that contributed to the formation of an Intype.

3.1 Stow

InType

Stow



Definition

Stow refers to various manual motions associated with revealing or concealing interior components in order to save space or to provide for multiple functions. The motions require specialized hardware to achieve their open or closed functions, and a spatial cavity is required to conceal a component.

Description

This essay examines how motions associated with revealing or concealing components, coupled with certain types of specialized hardware, transformed interior spaces at various scale. The development of Stow can be divided into two categories according to the transformative action: 1) Fold motions, 2) Push and pull motion.

Fold motion utilizes a section of an interior plane that fall, fold, and flip out to provide a horizontal surface. Stabilizing mechanism such as hinged legs, bars, and poles are often part of the component. A cavity within the housing plane is required to store the object in motion. Examples show a wide range of practice types such as residences, clothing retail, food and beverage facility, and hospitality. When closed uniform materiality of interior planes reinforces the spaciousness and openness of the space, fulfilling aesthetic need of users.

Push and pull motion transforms an interior through the emergence of retractable furniture pieces. A volume of space within a plane stows the moving component. The face of a plane is flush with the frontal side of the component. The difference between materiality of the plane and furniture pieces may become visual cues, creating a unique composition. Most of push pull motion has been found in residential interior where highly personalized usage of space is desired.

Stow Motions Related to Furniture Types and Hardware

Chief among the hardware types that enabled the motions of fall, fold, push-pull, swing, or multiple motions was the simple hinge—a jointed or flexible device that allows the turning or pivoting of a part, such as a door or lid, on a stationary frame. There is a long history of the use of metal hardware, but the first achievement in joining elements together was lashing, and the first materials were “thongs of hide, leather, narrow copper bands, or linen string.”[11]

[11] Joseph Aronson, *The Encyclopedia of Furniture* (New York: Crown Publishers, 1938), 12.

The first door hinge was a socket stone. As early as 4500 B.C., a block of stone fixed in the floor of the door way, with a cup-like depression in the upper surface was used in Hassuna, Assyria.[12] Until the metal hinge came into use, doors were swung on poles projecting slightly above and below the margins of the door frame. The upper end hung freely in a loop of hide fixed to the door post and the lower end stood in a hollow in a stone embedded in the floor at the foot of the door post.[13]

The use of metal hardware emerged during the Fourth Dynasty when Egyptians made hinges and locks for boxes and furniture. During the Eighteenth Dynasty (1575-1315 BCE), Egyptians added to their hardware inventions the bronze “butt” hinge and the “blackflap” hinge. The camp bed of Tutankamen (1350 B.C.) had massive copper hinged sockets with subsidiary hinges for folding legs.[14] After 1680, iron was used.

During the European Renaissance (15th-16th centuries), cabinet makers began using the “butterfly” hinge to make furniture pieces that open, close, and expand. This simple hinge was used for doors, flip-top surfaces, or to expand a surface area. In the 15th century in England and France, the draw-top table described a refectory type table with a double top, the lower of which is in two sections pulling out at the ends to increase the length of the extended

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[12] Charles Singer and E.J. Holmyard Ed. *A History of Technology: From Early Times to Fall of Ancient Empires* vol. 1 (London: Oxford, 1955), 194.
[13] Aubrey F. Burstall, A History of Mechanical Engineering (London: Faber and Faber, 1963), 43.
[14] Singer. A History of Technology vol. 2, 235.

table.[15] Draw-top gaming tables were developed in the 18th and 19th centuries.

During the 16th century, English cabinet makers found a way to build a large table that could be expanded by making a table called a gate-leg. A gate-leg table refers to the whole classification of tables in which one or more drop leaves are supported by a leg or gate which swings away from a central fixed structure.[3] Underneath the table top, a leaf at each end could be drawn out, supported on sliding bearers,[16] with no hardware. It was popular in England, the Netherlands, and America between 1650 and 1720. Butterfly hinge was first used to support the leaves of the gate-leg table between 1700 and 1750 by American furniture makers.[17] In the mid-17th century Europe, flip-top consoles appeared using a butterfly hinge as the counter balancing mechanism to provide an extended surface area when needed.[4]

Instead of having a separate and designated space for washing and excretion, late 18th century designers such as Hepplewhite, Shearer, and Sheraton designed a type of furniture that housed the function of the present day's bathroom. Sheraton writes, "They (wash basins) may stand in a genteel room without giving offense to the eye."[18] The basin stands and washing stands are placed in one's bedroom, thus concealment was an important attribute. A

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[15] Joseph Aronson, *The Encyclopedia of Furniture* (New York: Crown Publishers, 1938), 54.
[16] Peter Phillp, *Furniture of the World* (London: Optopus Books Limited, 1974), 100-101.
[17] Peter Phillp, *Furniture of the World,* 102.
[18] Boger. *Furniture Past & Present* (New York: Doubleday Company Inc., 1966), 355.

chest with drawers and fold out tops revealed essential features like mirror, bidet, sink, and storage for toiletry. When closed, the wash basin resembles a chest with drawers. Eventually these units became extinct with the development of sewage system and the invention of the toilet. (See Figures 2.1.3 and 2.1.4)

Several types of dressing tables utilizing push and pull motion appeared toward the end of the 17th century in England and France. Featuring mirrors, storage bins and grooming devices contained in drawers, dressing tables were simpler in form than wash basins. All of the drawers could be pulled out at once to reveal everything one needed.

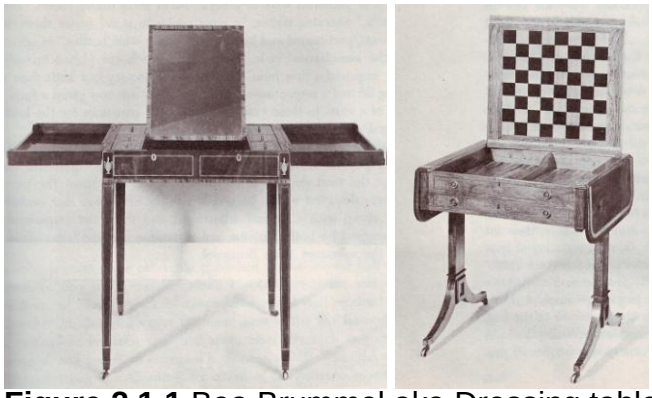
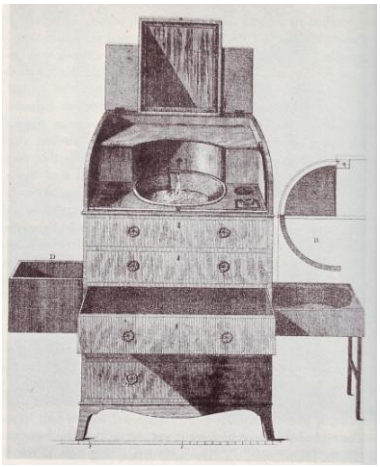


Figure 2.1.1 Bea Brummel aka Dressing table with compartments for toiletry, 1792

Figure 2.1.2 Game table with a sliding and reversible top, 1795

PhotoCrd: Louise Ade Boger, Furniture Past and Present (New York; Doubleday and company inc.1966), 337, 350.

Medieval England contributed a table with leaves that open out.[19] The "Beau Brummels" of England and the Pourdreuses of France are outstanding examples of 18th century pull-out furniture.[20] (See Figure 2.1.1)



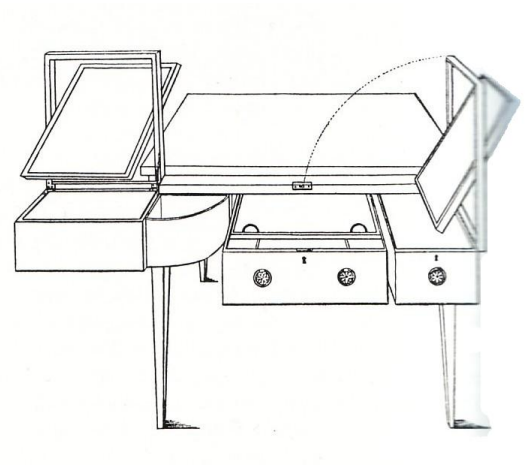


Figure 2.1.3 Wash hand table, 1792.

Figure 2.1.4 Toilet Table, 1797, Designed by Thomas Shearer

PhotoCrd: Louise Ade Boger, Furniture Past and Present (New York; Doubleday and Company inc.1966),356.

Demountable and folding beds were used by travelers, campers, settlers and soldiers, including Dutch colonists who used hinged beds in their American settlements. In the 17th century, a Swedish traveling cot could be folded into a box form which contained leg supports for the bed. A Bed Trunk made by Louis Vuitton in 1892 also featured a foldable cot within a trunk designed

[19] Leslie Pina, *Furniture in History* (Upper Saddle River, New Jersey: Pearson Education Inc., 2003), 3.
[20] Aronson, *Encyclopedia of Furniture*, 181.

specifically for explorers.[21] Patents were registered for convertible beds that folded into sofas, chairs, wardrobes, and even piano cases.[22]

One of the earliest furniture applications of the Fold motion was the fall-front writing desk (secretaire, escritoire, secretary desk) with a fall-front surface. The desk emerged during the 17th century, a period in which no room was considered fully furnished without writing facilities for the literate and upper classes.[23] (See Figure 2.1.5) The secretary desk provided a hinged writing surface that also functioned as a door front for safeguarding drawers or letters. The butterfly hinge enabled the fall-front motion. In Spain, the vargueno, a wooden chest with a drop-front writing surface, a series of cupboard and drawers, and handles on the sides, was carried by members of Spanish court as they traveled from one place to another.[24]

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[21] J.G. Links, Paul Fussell, and Ralph Caplan, *Bon Voyage: Design for Travel, 69.*

[22] Henry Urbach, *Morpheus Mepris: The Murphy Bed and Obscene Rest* (Cambridge: Cambridge Architectural Journal, 1996), 17.

[23] John Gloag, *A Social History of Furniture Design* (New York: Crown Publishers Inc., 1966), 164.

[24] Deborah Shinn et al, *Bon Voyage: Design for Travel* (New York: The Smithsonian Institution, 1986) 35.

Figure 2.1.5 Secretary desk 17th Century
PhotoCrd: Franklin H. Gottshall, Period Furniture, Design, and Construction (New York: Bonanza Books, c 1937) 73.

Figure 2.1.6 Comprehensive Storage System by George Nelson, ca. 1960
PhotoCrd: Wright20
http://www2.wright20.com:8080/Web_Individual_Lots/ALD7/462 (Accessed 6/15/10)

In the mid-20th century, designers incorporated similar hinges into their furniture designs. Considered one of the masters of Modernism, Marcel Breuer also designed furniture that utilized a fall front surface as a part of cantilevered wall cases for Heal & Son in London. A desk by Eero Saarinen, a winning design at the "Organic Design Competition" held at the Museum of Modern Art in 1940, and George Nelson's furniture line for Herman Miller Furniture Company shows an adaptation of the fall-front into storage furniture (1946).[25] Employed by the Herman Miller Company, George Nelson set out to design a modular storage system for residences and the office environment. 'Comprehensive Storage System' offered versatile ways to arrange standardized storage modules, which included a drop front writing surface that performed like a secretary desk. (See Figure 2.1.6) The ease of simple

[25] George Nelson, *Storage* (New York, Whitney Publications, Inc., 1954), 49.

construction and its usefulness enabled fold mechanisms to develop into modern pieces of furniture.

Pull out surfaces evolved into modern furniture storage which was popular in residences during the mid 20th century. Architect Felix Augenfeld designed a cocktail cabinet (1943) that stored liquors and bar tending equipment and serving trays pulled out from the unit. The cabinet provided an instant mini-bar for entertaining purposes. (See Figure 2.1.7)

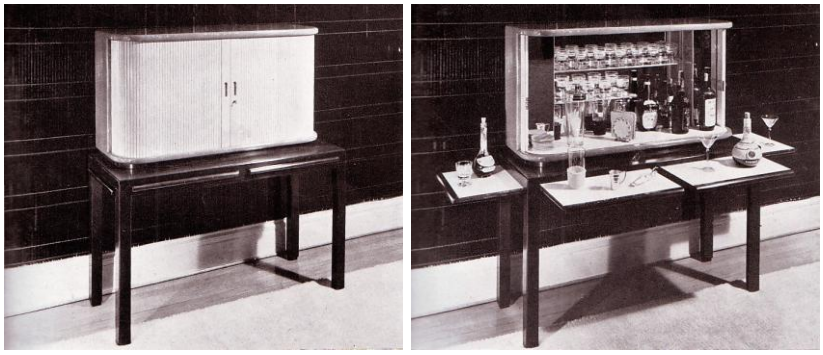

Figure 2.1.7 Cocktail cabinet with pull out trays designed by Architect Felix Augenfeld in 1943. Left shows closed cabinet; right shows shelves for glasses and liquor bottles inside with four slides acting as serving trays.
PhotoCrd: Interiors, May 1943, 57

Another popular American invention which addressed the fold motion was the reclining chair, or “La-Z-Boy.” Patented in 1928, the chair involved slots along which its back, seat, and the supports for a rising foot platform could slide. Shoemaker and Knabush, the inventors of “La-Z-Boy” continued to introduce a series of variations, such as a built-in ottoman chair, “Otto-matic,” and a reclining chair with vibrating mechanism called the “Tranquillator.” The chair became a symbol of relaxed life in America during the latter half of the twentieth century.

The idea of mobile furniture unit was further developed by Italian designer Joe Colombo. In 1963 Colombo imagined a mini-kitchen as a 40” x 40” x 26” container with almost all of the functions of a full kitchen. The container included a two burner stove, a refrigerator, storage, cutlery drawers, a chopping board and a pull-out tray and fall front worktop, everything but the kitchen sink. Designed to serve up to six people, the container on wheels used just one electrical hookup. Currently, the kitchen systems manufacturer, Boffi, sells an updated version in Corian. (See Figure 2.1.8)

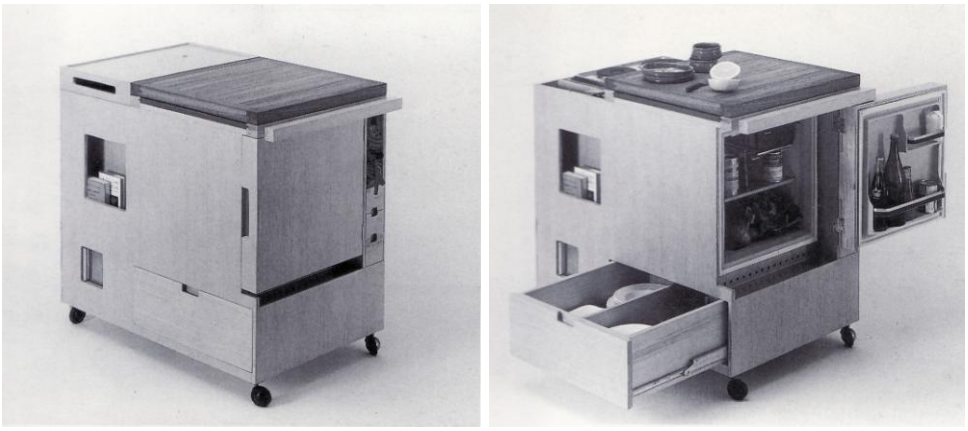

Figure 2.1.8 Mini-Kitchen by Joe Colombo.
PhotoCrd: Ignazia Favata, Joe Colombo and Italian Design of the Sixties (Cambridge, Mass.: MIT Press, 1988), 102.

The Fold Motion in Spaces

Along with the development of hinges, mechanism of concealment and storage of furniture components started to appear in interior spaces, creating flexible walls, floors, and ceilings. Many mid-century modern furniture designers incorporated fold-out surfaces as one of the components of modular storage system. The Fold motion is most often expressed as a component that folds out. The plane that opens depends on a counter-balance hinge to form a horizontal surface parallel to the ground. Depending on the height of where

the fold out occurs, and the size of the door surface, additional leg supports are used to stabilize the activity being done. Primarily, Fold focuses on the utilization of the horizontal surface when opened. The component folded out could serve as a place for general activities requiring hard flat surface, thus become a writing desk, bar top, dining table, or display shelf. The door plane closes and protects what is being stored inside the cavity, and when opened, provides a stable flat for activities usually involving the objects that it stores.

Fold Chronological Sequence

Mid 19th century to early 20th century parlor rooms served the purpose of a formal living room or a guest receiving room. Disguised as a piano, a desk, a bureau, a fireplace or a wardrobe, fold down beds were commonly found in the multifunctional hall. (See Figure 2.1.9)

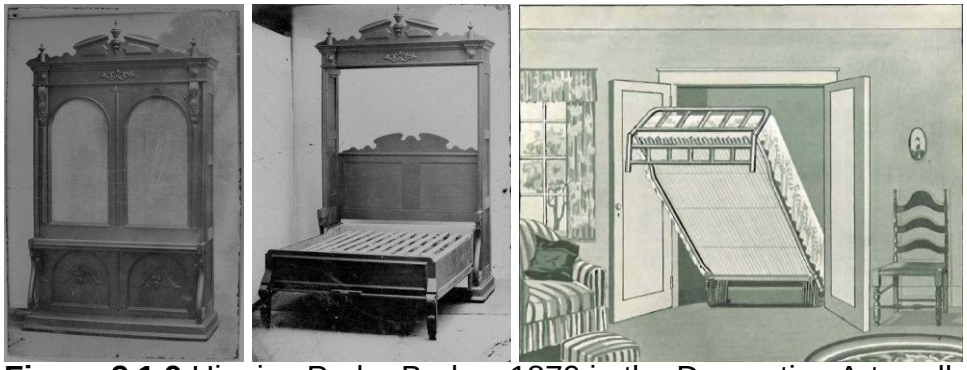

Figure 2.1.9 Higgins Parlor Bed ca.1870 in the Decorative Arts collection of the Brooklyn Museum**.** Left shows a cabinet with bed closed; middle shows bed folded down.
PhotoCrd: Brooklyn Museum, Collections: Decorative Arts: Higgins Parlor Cabinet / Bed
http://www.brooklynmuseum.org/opencollection/objects/2589/Higgins_Parlor_CabinetBed_Bed_Closed/set/c9ad68df838eaa663cf7b7338124b4c9?referring-q=parlor (Accessed June 13, 2010)

Figure 2.1.10 Steel frame of Murphy Bed. Springs and latches were used to fold up the structure.
PhotoCrd: Murphy Bed Company, Inc., “The Murphy In-A-Door Bed,” 1925.

A more mechanized version of the hideaway bed appeared in the early 1900s and became one of the most popular space-saving designs. The 'Murphy Bed' was invented in the early 1900s by Californian William L. Murphy who sought a way to accommodate a larger bed for himself and his new wife in a one-room San Francisco apartment. The Murphy bed utilized various types of diverse spring and mattress combinations, including steel ribbon fabric springs, box and inner springs, and single or double deck coil mattresses. (See Figure 2.1.10) With the bed concealed (flush with the wall), a room could function as a living or dining room. When the bed was revealed (folded out), a room shifted from its previous use to become a bedroom. Leading designers also incorporated hideaway beds in affluent urban interiors. For example, in 1939 the architect Erno Goldfinger installed a hideaway bed for a small bedroom in his Hampstead House.[26] There has been an ebb and flow in the demand of Murphy bed. Continuous appearance in trade journals happened until 1970s. The demand started to return in 1990s to present, especially in urban residences.

Contemporary with the Murphy bed, pull-down beds became popular in train and ship cabins. Due to the popularity of traveling and developments in technology, designers and engineers were motivated to provide comfortable, yet space efficient sleeping spaces in 19th century steamships and train cars. In 1867 George M. Pullman began manufacturing the first railroad sleeping cars with bunk beds. Pullman cars continued to develop until about 1950 when

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[26] Urbach, Morpheus Mepris, 18; Murphy Bed Company, Inc., http://www.murphybedcompany.com (Accessed 3 / 6/ 2009)
Annie Carlano and Bobbie Sumberg, *Sleeping Around: The Bed from Antiquity to Now* (Seattle: University of Washington Press, 2006), 113.

the “Roomette” was introduced. The Roomette, with its convertible beds and fold-out surfaces, targeted traveling families and the business traveler (See Figure 2.1.11). In the 1930s, when travel time between Germany and New York was shortened to three days, commercial air flights introduced a folding washstand, and a collapsible writing table.[27]

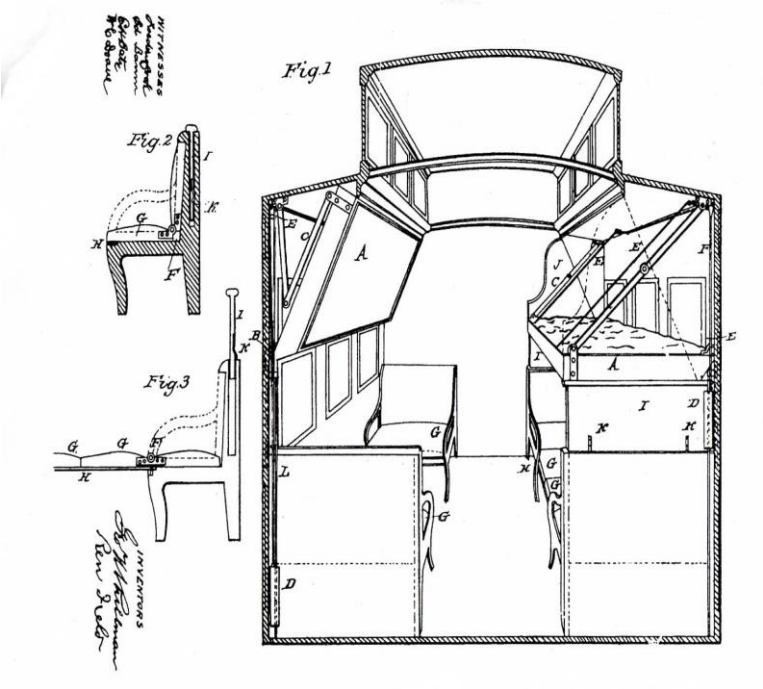

Figure 2.1.11 Pullman Sleeping Car, 1865. Patent no. 499992, patented Sept. 19, 1865.
PhotoCrd: http://www.google.com/patents?id=WW8fAAAAEBAJ&dq=49992 (Accessed 4/22/10)

In residential environments the advantage of stowing horizontal surfaces provided relatively large additional space, creating an effect of owning another room. An apartment designed by Architect Albert E. Herbert in 1963 featured a modern living/ study room following the suite of the multipurpose parlor room

[27] Carlano and Sumberg, *Sleeping Around*, 101–103.

of a mansion. During the day the bed was stowed behind a storage cabinet enclosed by wood surface that encompassed from floor to ceiling and a section of adjoining wall. No visible cue was present on the elevation. Once opened, the fold out wall bed appeared to instantly turn the space into a guest bedroom. Stow utilized the limited square footage in the apartment without sacrificing essential living functions for the resident.

Figure 2.1.12 Apartment in Mahattan designed by Architect Albert E. Herbert in 1963. Left shows closed elevation stowing a wall bed. Right shows the space turned into a bed room from a living room / study.
PhotoCrd: Interior Design, Jun. 1963, 99.

During 1970s Interlubke, a German Furniture company, distributed modular storage units for offices and residential interiors. Advertisement of storage units with horizontal fold out surfaces and wall bed emphasized functional efficiency and flexibility. Customizable floor to ceiling storage units were designed to "hold, hide and display precisely as the occupants wished them to be."[28] A desk folded out from the unit creating an instant work area. The components can be folded back into the storage system out of sight. In the

[28] Interlubke Advertisement, "Living / study / dining / sleeping environment. …and you can take it with you," *Interior Design* 43, no.8, (1972): 89.

same line of furniture,' Sleeping Wall' featured pivoted display shelves to reveal a fold out wall bed. (See Figures 2.1.13 and 2.1.14)

Figure 2.1.13 Advertisement for Interlubke wall system. Left shows desk folded out from storage unit.
PhotoCrd: Interior Design, Aug. 1972, 89.

Figure 2.1.14 Middle and right show pivoting bookcase with a wall bed on the opposite side.
PhotoCrd: Interior Design, Apr. 1972, 99.

Design by Stephen Varady, the Perraton Apartment in Sydney (1992) applied the concept of Stow to create a 'never static' kitchen space. Fold out dining table transformed an otherwise empty space. (See Figure 2.1.15) At the headquarters of OXO International (1998) designed by Specht Harpman in New York, Stow was applied to provide versatile display schemes. Serving as a feature wall by the reception desk, the OXO kitchen utensils are showcased on the fold down surfaces. (See Figure 2.1.16)

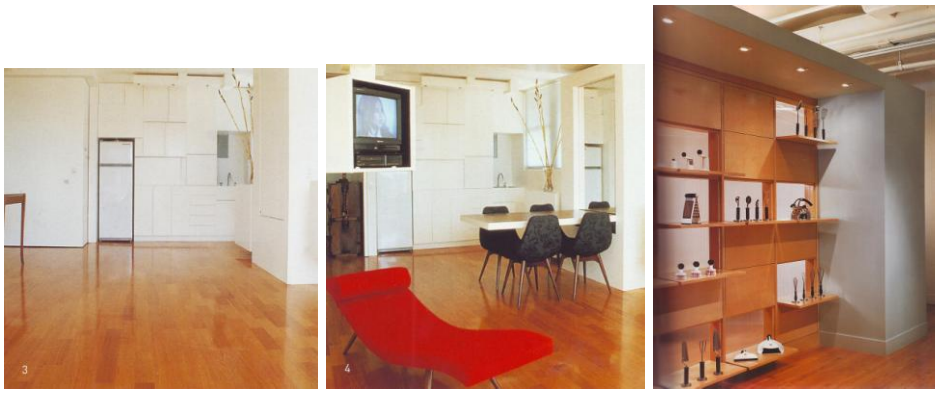

Figure 2.1.15 The Perraton Apartment in Sydney (1992) designed by Stephen Varady. Fold out dining table transforms the space into kitchen.
PhotoCrd: AD: Architectural Design, 2000, 81.

Figure 2.1.15 The Perraton Apartment in Sydney (1992) designed by Stephen Varady. Fold out dining table transforms the space into kitchen.
PhotoCrd: AD: Architectural Design, 2000, 81.

Figure 2.1.16 OXO International (1998) designed by Specht Harpman in New York. Rows of fold out surface makes a feature wall.
PhotoCrd: Interior Design, Oct. 1998, 161.

Suitcase House (2001) was part of an experimental development of the Commune by the Great Wall in Beijing, China. The architect for the Suitcase House attempted to rethink the nature of intimacy, privacy, spontaneity and flexibility. (See Figure 2.1.17) Use of sliding walls and hinged planes provide infinite interior arrangements and daily scenarios. The ground floor is an open volume divided by sliding walls, which can be opened up to reveal 44 meters by 5 meters space. From the ground level, a series of sub-ground interior chambers can be accessed by opening panels in the floor. Each hidden cavity under the floor is dedicated to specific function such as meditation, music, library, study, and a sauna. When all chambers are closed, the ground level can be used as uninterrupted floor space for parties and events. Occupants of

the Suitcase House can readily transform it according to the nature of activities, number of guests and degrees of personal privacy and enclosure.[29]

Figure 2.1.17 Suitcase House by Gary Chang (2001) Left shows hinged planes opened to reveal bathing room and cloak room hidden underneath the floor. Right shows audio/ visual room and meditation room.
PhotoCrd: Arian Mostaedi, Great Spaces: Flexible Homes (Barcelona, Spain: Page One Publishing Private Limited, 2006), 94, 95.

Designed by Rem Koolhaas, the Prada Store (2001) in New York City is different from other luxury brand stores. Stow was used as a strategy to combine commerce and entertainment. Koolhaas explored a more diversified role of today's fashion boutiques through the creation of an amusing multifunctional space. A swooping zebra wood wave spanning the length of the space provided a display area by day for mannequins. At night, a section of the wave structure folds out, revealing a platform for a performance. Metal display cages mounted on tracks make room for cultural events, and an audience sits on the steps facing the stage. (See Figures 2.1.18 and 2.1.19)

[29] Gary Chang, "In the Age of Indeterminacy-Towards a Non-Visual Pragmaticism," *Architectural Design* 70, no.4, (2003): 63.

This oversized hinged plane is akin to the petite secretary desk's stowed writing surface.

Figure 2.1.18 Prada Store designed by Architect Rem Koolhaas (2001) in New York City. Facing is a fold out stage as a part of wave structure used as a performance space.
PhotoCrd: John Pile, A History of Interior Design (Hoboken, NJ: Laurence King Publishing Ltd., 2005), 428.

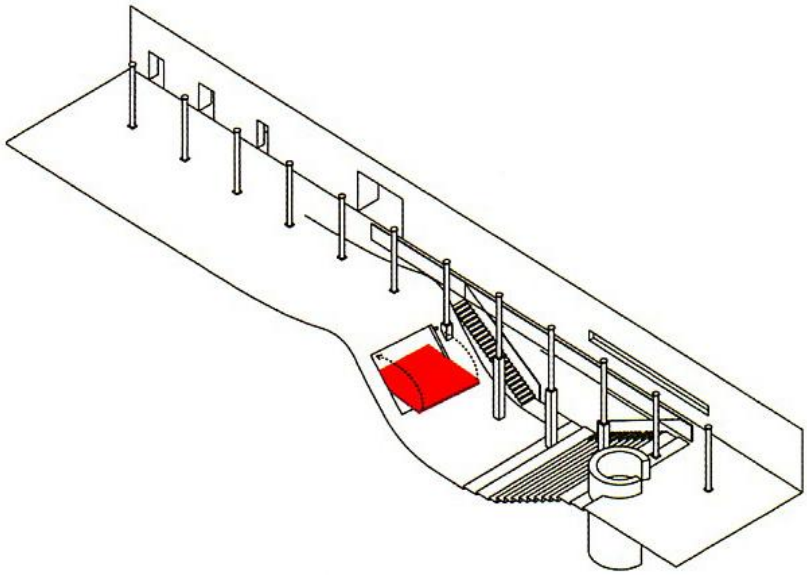

Figure 2.1.19 Axonometric diagram of the Prada Store (2001) designed by Rem Koolhaas in New York City. Facing steps where audiences can sit, fold out platform is shaded red to show the motion of transformation.
PhotoCrd: Alejandro Bahamon, Ana Canizares, Antonio Corcuera ed. Corporate Architecture: Building a Brand (Barcelona, Spain: Parramon Ediciones, S.A., 2009), 16.

Shipping containers have been recently used by architects and designers, such as Jennifer Siegal and firms like LOT-EK, as a medium to construct residential buildings. Adam Kalkin, an architect and artist escalated the notion by designing the Push Button House (2004) which is a shipping container that opens to reveal living accommodations. Hydraulic cylinders provided automated movement of faces of the container, which weighs a ton each, to open out. Stowed is a furnished space consisting of a bedroom, bathroom, living room and study. All furniture pieces are bolted intact to interior surface. Although not made to be utilized as a practical home, Push Button House elicits multiple dialogues between issues such as sustainability, mobility, automation and living standard. Italian coffee company illy cooperated with Kalkin to make a Push Button Coffee house for the brand to communicate to patrons their commitment to art, innovation, and sustainability. A kitchen, equipped with espresso machines and seating for coffee drinkers, was revealed upon opening the sides of a shipping container. (See Figures 2.1.20 and 2.1.21)


Figure 2.1.20 Push Button House (2004) design by Architect and Artist Adam Kalkin. Inside the house is furnished with furniture pieces bolted to folding surface planes.
PhotoCrd: L'Architecture D'Aujourd'hui, Nov.-Dec., 2006, 107.

Figure 2.1.21 Push Button Coffee House for Italian coffee company Illy. The structure was exhibited at the Time Warner Center in December 2007 and at the New York Wine and Food Festival in the Meatpacking District in October 2008.
PhotoCrd: illy Coffee, "It's the Ultimate "Open House": illy Push Button House," http://www.illy.com/wps/wcm/connect/us/illy/art/project/push-button-house/ (Accessed June 13, 2010)

The Push-Pull Motion for Spaces

Stow's push-pull motions include pull up, push down, pull out, push in functions. The two essential characteristics of Pull Out are retractability and concealment. Unlike Fold motions where the plane is broken to provide a platform, Push-Pull motion brings components that were hidden inside the wall cavity into the interior space. The visual effect creates puzzle-like tectonic quality as secret components emerge out from the walls, floors and ceilings.

Stowed inside a cavity, some objects may offer a visual cue to their presence in the interior. For complete concealment, the face of the component in motion is disguised with the same material as the adjoining plane, rendering a seamless elevation when pushed inside. On the other hand, some designers

deliberately differentiate the material and color of the stowed element, forming a geometric composition on the interior plane.

Push-Pull Chronological Sequence

In the early 1970s Joe Colombo extended his Mini-Kitchen prototype by designing a Total Furnishing Unit as a dwelling unit for mass production. He believed that the space within this unit needed to be dynamic, adapting to inhabitant's life style. The unit stows various types of furniture inside. The push and pull motion becomes an agent in transformation. Upon the pulling motion of a habitant, surfaces for dining, storage, and working slide out from various heights and locations. The space supports multiple living functions, transforming the nature of space at any instant.[30] (See Figure 2.1.22)

Figure 2.1.22 Total Furnishing Unit by Joe Colombo. Left shows dining scheme with a table folded out. Right shows closet pulled out to form a partition.
PhotoCrd: Ignazia Favata, Joe Colombo and Italian Design of the Sixties (Cambridge, Mass.: MIT Press, 1988), 102.
Mateo Kries and Alexander von Vegesack Ed. Joe Colombo - Inventing the Future (Weil am Rhein: Vitra Design Museum, 2005), 271.

[30] Emilio Ambasz, *Italy: The New Domestic Landscape* (New York: The Museum of Modern Art, 1972), 172.

In the 1980s, Allan Wexler created an experimental art installation titled “Little Building for Two Activities” at the Katonah Museum of Art in New York. (See Figure 2.1.23) Wexler explored the concept of an inexpensive, compact house for daily living and the perception of furniture sets in small or large settings. He modified the suburban backyard shed to store pieces of furniture in “crate-like projections that bulge” out of the walls of the building. The furniture vignettes, such as a table and two chairs, could be pushed from an interior wall to an exterior wall, and pushed back from the outside to the inside. When the furniture was located inside of the shed, the chairs and table were perceived as quite large, dominating the interior space. In contrast, when the furniture was pushed out the wall to the exterior, the furniture appeared smaller and insignificant in the context of the larger environment.[31] Wexler further developed his idea into a full-scale interior when he designed the living quarters for artist in residence at the Mattress Factory. The bed and night stand pulled out from the wall on wheels. The bed moved through a shared wall, emerging into the space where it was needed.[32] The presence of the bed, lights and end tables were visible by their frontal side exposed and as a part of the elevation.

[31] Allan Wexler, “Assemblage,” *House Rules* No.24 (Cambridge, Mass.: MIT Press: 1994), 94.
[32] Carlano and Sumberg, *Sleeping Around*, 113.

Figure 2.1.23 Wexler, Living quarter for the Mattress Factory gallery residence, 1988.
PhotoCrd: Carlano and Bobbie Sumberg, Sleeping Around: The Bed from Antiquity to Now (Seattle: University of Washington Press, 2006), 112.

In 1998 the architectural firm, pool Architektur ZT GmbH, converted rooftop space with load bearing restriction into a habitable space, 'Penthouse T.Q.,' equipped with essential living functions. The penthouse featured a 200 square foot rooftop retreat with a bed, table, and cupboard—all of which slide in and out from a wall. When all of the furniture was tucked into the wall, the empty floor area became visually and functionally expansive. Depending on which pieces of furniture were acquired from their hidden places, the room transformed from one function, such as work place, to another, for example, a bedroom.

Figure 2.1.24 T.Q. Penthouse designed by Pool Architektur ZT GmbH (1998) Four different layouts are possible.
PhotoCrd: Arian Mostaedi, Great Spaces: Flexible Homes (Barcelona, Spain: Page One Publishing Private Limited, 2006), 66-67.

Stow is a strategy to save valuable circulation area in a house on the northern island of Hokkaido, Japan designed by Architect Yoshio Maruyama. Created to fit between storage units, the ladder staircase is fully concealed only showing a diagonal line on the interior elevation. Painted red, the ladder creates a focal point among the storage units. The ladder is revealed through push-pull motion, sliding sideways on ceiling-mounted track. (See Figure 2.1.22)

Figure 2.1.25 Residence designed by Architect Yoshio Maruyama in Hokkaido, Japan. Sliding staircase ladder can be stowed away to clear the floor area when not in use.
PhotoCrd: Michael Freeman, Space: Japanese Design Solution for Compact Living, (New York: Michael Freeman, 2004): 206.

No limit exists where Stow was used in the apartment of Environmentalist, Leslie Hoffman. Furnishing the studio with a bed, desk, and sofa, Hoffman was able to fit all three in the same space without compromising any functionality by using a pulley system for the drop down bed. When closed during the day, the volume of the bed structure forms a dropped ceiling with recessed lighting that defines the work area. At night, the electronic pulley system suspends the bed and positions it on top of the desk unit, which stabilizes the weight. (See Figure 2.1.23)

Figure 2.1.26 Residence of Leslie Hoffman. Left shows a living room / office setting with fold out desk top. Right shows the bed lowered by pulley system from the ceiling.
PhotoCrd: Marisa Bartolucci, *Living Large in Small Spaces* (New York: Harry N. Abrams, Inc. Publishers, 2003), 114.

The Drawer House (2003), designed by Nendo led by Architect Oki Sato, is a house operated by motion. An apparently empty room, devoid of furniture and miscellaneous objects, provides a full range of household functions - tables, beds, shelves, partitions and whole rooms-which can be drawn out when required and retracted into the wall when no longer useful. Essential functions like the kitchen and the bathroom are hidden behind closed doors. When everything is stowed away; the house provides a big open space, a scarcity in the city of Tokyo. Drawer House is in constant ebb and flow of action and rest and between a multifunctional cluttered space and the restful minimalism throughout the day.[33] It empowers residents to choose the interior layout fit for various occasions. (See Figure 2.1.24)

[33] Arian Mostaedi, “Nendo, Drawer House,” *Great Spaces: Flexible Homes*, (Barcelona, Spain: Carles Broto I Comerma): 202.

Figure 2.1.27 Drawer House (2003) designed by Nendo led by Architect Oki Sato. Left shows streamlined elevation treated in white ash wood; right shows a bookcase, desk, chair and a filing cabinet set pulled out by a handle. PhotoCrd: Arian Mostaedi, "Nendo, Drawer House," *Great Spaces: Flexible Homes*, (Barcelona, Spain: Carles Broto I Comerma): 202.

The main advantage of Stow's push-pull is the possibility of obtaining open space in a limited area. Innovative solutions, illustrated in Architect Gary Chang's Hong Kong apartment (2006), offer a new conceptual model for small apartments. The 344 square foot space offers twenty-four space layouts: kitchen, library, laundry room, dressing room, a lounge with a hammock, an enclosed dining area and a wet bar. Chang used shifting wall units suspended from steel tracks bolted into the ceiling and each wall unit contained necessary furnishings equipped for different functions. Unlike precedent interiors that achieved open space through clearance of moving wall components into an interior plane, Chang's apartment offers various types of spaces created between these units operated by push-pull motion. Chang hopes that his design will solve the city's ongoing shortage of space.[34] (See Figure 2.1.25)

[34] Virginia Gardiner, "24 Rooms Tucked into One," *New York Times,* Janurary 15, 2009, Home and Garden section, New York edition.

Figure 2.1.25 Gary Chang's apartment in Hong Kong. Left shows view into an open space, when units are all tucked in to the left side. The right shows units pulled out to reveal kitchen and bath tub.
PhotoCrd: Virginia Gardiner, "24 Rooms Tucked into One," *New York Times,* Janurary 15, 2009, Home and Garden section, New York edition http://www.nytimes.com/slideshow/2009/01/15/garden/20090115_HONGKONG_index.html (Accessed 5/12/10)

Wide application of Stow in contemporary interiors may seem like Stow is a modern design invention, however the simple idea of revealing or concealing interior components has been practiced since 15th century. Stow started with furniture pieces that fall, fold, push-pull; gradually making its way into architectural elements, such as a walls, ceilings and staircases, which manipulate the volume of interior space. A half century ago designers Joe Colombo and Ettore Sottsass incorporated Stow into their experimental projects in anticipation of the future home. Development of hardware enabled heavier components to be stowed. Automated transformation activated by push of a button became possible. With innovative materials and hardware, Stow in the 21st century is often executed in visually streamlined fashion within existing architectural elements focusing on the concealment, alleviating aesthetic concerns of exposed hardware. The stowing of one furniture piece makes room for another, thereby eliminating the need for floor area without sacrificing essential living components. And the concealment of the traces of

daily activities offers a refuge in overly populated and stimulated life styles of the contemporary era. The chronological evidence of Stow shows a true variety of execution, scale, use, and applications of how we “stow” away our spaces.[35]

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[35] Evidence for the use and the chronological sequence of Stow as a Transformative Interior archetype was developed from the following sources: **1950** Residence [1956] Everett Brown; San Francisco in Staff, “Designed for Compact Living,” *Interior Design* 27 no. 2 (Feb. 1956): 72; PhotoCrd: Anonymous; **1960** Tainer showroom [1960] George Tainer, Inc.; New York, NY in Harry V. Anderson, “Market Spotlight,” *Interior Design* 60(31) no. 6 (Jun. 1960): 73; PhotoCrd: James Vincent; Anonymous Apartment [1963] Albert E. Herbert; Manhattan in Ivan Rigby, “The Contemporary Idiom,” *Interior Design* 34 no. 6 (Jun. 1963): 99; PhotoCrd: Albert E. Herbert; National Hotel-Motel Exposition [1963] John Courtney; Shirley, Long Island, NY in Alexandre Georges, “And the Livin' is Easy,” *Interior Design* 34 no. 6 (Jun. 1963): 105; PhotoCrd: O. Philip Roedel; The Midas Room [1963] Barbara Dorn;, NYC in Staff, “Hotels and Motels,” *Interior Design* 34 no. 10 (Oct. 1963): 156; PhotoCrd: Alexandre Georges; Mini-Kitchen [1963] Joe Colombo; in Ignazia Favata, *Joe Colombo* (Massachusetts; The MIT Press, 1988), 123; PhotoCrd: Ignazia Favata; Rooms of Tomorrow / National Hotel-Motel Exposition [1964] Richard Himmel; New York, NY in Staff, “Hotels and Motels,” *Interior Design* 35 no. 10 (Oct. 1964): 150; PhotoCrd: Anonymous; Room of Tomorrow/ National Hotel-Motel Exposition [1965] Henry End; New York, NY in Staff, “Hotels,” *Interior Design* 36 no. 10 (Oct. 1965): 195; PhotoCrd: Anonymous; Wardrobe Bed [1967] Salvati and Tresoldi; Italy, Emilio Ambasz, *Italy: The New Domestic Landscape* (New York: The Museum of Modern Art, 1972), 127; The Museum of Modern Art; All in One [1967] Internotredici; Italy, Emilio Ambasz, *Italy: The New Domestic Landscape* (New York: The Museum of Modern Art, 1972), 133; PhotoCrd: The Museum of Modern Art; Central Block

[1969] Snaidero; Italy, Emilio Ambasz, *Italy: The New Domestic Landscape* (New York: The Museum of Modern Art, 1972), 125; PhotoCrd: The Museum of Modern Art; Visiona [1969] Joe Colombo; Italy in Ignazia Favata, *Joe Colombo* (Massachusetts; The MIT Press, 1988), 103; PhotoCrd: Ignazia Favata; **1970** Total Furnishing Unit [1971] Joe Colombo; Italy in Ignazia Favata, *Joe Colombo* (Massachusetts; The MIT Press, 1988), 111; PhotoCrd: Ignazia Favata; Eurodomus 4 Competition [1972] Alberto Rosselli; Turin, Italy in Evelyn Clark, "Eurodomus 4: Two Faces of the Home Living and Services," *Interior Design* 43 no. 8 (Aug. 1972): 115; PhotoCrd: Anonymous; Sleeping Wall Advertisement [1972] ICF; Interior Design 43 no. 4 (Apr. 1972): 99; PhotoCrd: ICF; International House of Marshall Field & Co. [1972] Pat Hoffman / International Contract Furniture; New York, NY in Staff, "In the News: Commerce and the Consumer," *Interior Design* 43 no. 8 (Aug. 1972): 82; PhotoCrd: Anonymous; Storage Unit Advertisement [1972] Interlubke; *Interior Design* 43 no. 8 (Aug. 1972): 89; PhotoCrd: Interlubke; Igloo-9 Minibar Refridgerator [1978] Paolo Peolegrini / ICF; *Interior Design* 49 no. 13 (Dec. 1978): 45; PhotoCrd: ICF; Single Bedroom [1978] Elaine Lewis and Terence Goldsack; New York, NY in Staff, "NEWS: Model Flats Play Part in Sharp Occupancy Rise," *Interior Design* 49 no. 9 (Sep. 1978): 36; PhotoCrd: Anonymous; **1980** Charles J. Dilon's Residence [1980] Udstad & Dandridge; New York, NY in Anonymous, "Flexibility is the Keynote," *Interior Design* 51 no. 3 (Mar. 1980): 221; PhotoCrd: Jaime Ardiles-Arce; Living quarter for the Mattress Factory gallery residence [1988] Allan Wexler; Pittsburg, PA in Carlano and Bobbie Sumberg, *Sleeping Around: The Bed from Antiquity to Now* (Seattle: University of Washington Press, 2006), 112; PhotoCrd: Allan Wexler; **1990** The Parraton Apartment [1992] Stephen Varady; Sydney, Austrailia in Jonatahn Bell, "Building Ideas," AD: Architectural Design 70, no. 4; pg81; PhotoCrd: Stephen Varady; Parsons Kitchen [1994] Allan Wexler in Ellisheva Levi, "Room in a Box: the Intrigue with Compact and Convertible Interiors," Architectural Record 189 no.8 (Aug. 2001): 93, plate 2; PhotoCrd:

Allen Wexler; Vinyl Milford House [1994] Allen Wexler in Marisa Bartolucci, *Living Large in Small Spaces* (New York: Harry N. Abrams, Inc. Publishers, 2003), 13; PhotoCrd: Ronald Feldman Fine Arts, New York; OXO International [1998] Specht Harpman; New York, NY in Henry Urbach, "Sure Grip," *Interior Design* 69 no. 12 (Oct. 1998): 160; PhotoCrd: Michael Moran; Penthouse T.O. [1998] Architektur; Vienna, Austria in Arian Mostaedi, *Great Spaces: Flexible Homes* (Barcelona, Spain; Carles Broto I Comerma, 2006), 66; PhotoCrd: Hertha Hurnaus; Anonymous Residence [1999] Anonymous; Jane Graining, *Compact Living* (San Francisco; Soma Books, 1999), 7; PhotoCrd: Soma Books; Anonymous Residence [1999] Anonymous; Jane Graining, *Compact Living* (San Francisco; Soma Books, 1999), 73; PhotoCrd: Soma Books; **2000** Archilab LivingRoom [2000] Juan Pablo Molestina / Gruppe MDK, Aysin Ipekici; Orleans, France in Arian Mostaedi, *Great Spaces: Flexible Homes* (Barcelona, Spain; Carles Broto i Comerma, 2006), 23, PhotoCrd: Volker Seding; Suitcase House Hotel [2001] Gary Chang; Beijing, China in Gary Chang, "In the Age of Indeterminacy-Towards a Non-Visual Pragmaticism," *Architectural Design* 70, no.4, (2003): 63; Prada Store [2001] Rem Koolhaas; New York, NY in John Pile, *A History of Interior Design* (Hoboken, NJ: John Wiley & Sons, 2005), 428; PhotoCrd: Office for Metropolitan Architecture; Studio Flat, Womb: Work, Office, Meditation, Base [2002] Johnson Chou; Toronto, Canada in Anonymous, "Womb Service," *The Architectural Review* 213 no. 1271 (Jan. 2003): 20; PhotoCrd: EMAP Architecture; Residence in TriBeCa [2003] Roger Hirsh in New York, NY in Edie Cohen, "All the Right Moves," Interior Design 74, no. 11 (Sep. 2003): 244, 247; PhotoCrd: Michael Moran; Residence [2003] Yoshio Maruyama; Hokkaido, Japan in Michael Freeman, *Space: Japanese Design Solutions for Compact Living* (New York; Michael Freeman, 2004) 206; PhotoCrd: Michael Freeman; Drawer House [2003] Nendo Architects; Tokyo, Japan in Arian Mostaedi, "Nendo, Drawer House," *Great Spaces: Flexible Homes*, (Barcelona, Spain: Carles Broto I Comerma): 202; PhotoCrd: Nacasa & Partners; Leslie Hoffman's Residence

[2003] Leslie Hoffman; New York, NY in Marisa Bartolucci, *Living Large in Small Spaces* (New York: Harry N. Abrams, Inc. Publishers, 2003), 114, 115; PhotoCrd: Radek Kurzaj; Grand Hotel La Florida [2004] Dale Keller; Florida in Craig Kellogg, “High Hopes,” *Interior Design* 75, no. 8 (June 2004): 184; PhotoCrd: Annie Schlechter; Black Treefrog, Apartment unit [2004] Splitterwerk; Bad Waltersdorf, Austria in Arian Mostaedi, *Great Spaces: Flexible Homes* (Barcelona, Spain; Carles Broto i Comerma, 2006), 23, PhotoCrd: Paull Ott; Push Button House [2004] Adam Kalkin Architecture; Exhibited in Miami, built in New York; in Adam Kalkin, "Push Button House, installation," L'Architecture D'Aujourd'hui 36 7 (Nov.-Dec., 2006): 106, 107; PhotoCrd: Peter Aaron / ESTO; Optibo [2005] White Design; Goteborg, Sweden in Virginia Gardiner, “Warmth and Mechanics: Optibo,” *Dwell* 4 no. 4 (Mar. 2005): 78; PhotoCrd: Grant Scott; Modern Murphy Bed Advertisement [2006] Sellex; *Interior Design* 77 no. 2 (Feb. 2006): 92; PhotoCrd: Sellex; Loft [2007] Roger Hirsh; New York, NY in Amanda Lam and Amy Thomas, *Convertible Houses* (Layton, UT: Gibbs Smith, 2007), 158, 159; PhotoCrd: Gibbs Smith; Mini Kitchen-Updated [2007] Joe Colombo/ Boffi; Boffi Advertisement, *Interior Design* 78 no. 3 (Mar. 2007): 282; PhotoCrd: Boffi; Yla-Hokkala Residence [2007] Gandini; London, UK in Bethan Ryder, “A Dazzling Performace,” *Interior Design* 78 no. 14 (Nov. 2007): 92; PhotoCrd: Klevens Ortmeyer; Evidence for the use and the chronological sequence of Stow as a Transformative Interior archetype was also developed from site visits conducted by the researcher, Elizabeth Erin Lee, in the 2007-2010 period: New York City-Prada Store.

1960S

Title | **Tainer showroom**
Credit | James Vincent

Tainer showroom [1960] New York, NY

Design | George Tainer, Inc.

Copyright Citation |
Tainer showroom [1960] George Tainer, Inc.; New York, NY in Harry V. Anderson, “Market Spotlight,” *Interior Design* 60(31) no. 6 (Jun. 1960): 73; PhotoCrd: James Vincent

1960S

Title | **Anonymous Apartment**
Credit | Albert E. Herbert

Anonymous Apartment [1963] Manhattan in Ivan Rigby
Design | Albert E. Herbert

Copyright Citation |
Anonymous Apartment [1963] Albert E. Herbert; Manhattan in Ivan Rigby, “The Contemporary Idiom,” *Interior Design* 34 no. 6 (Jun. 1963): 99; PhotoCrd: Albert E. Herbert

Figure 3.1.26 Stow: Photographic Timeline

Figure 3.1.26 (continued)

1960S

Title | **Mini-Kitchen**
Credit | Studio Joe Colombo, Milan

Mini-Kitchen [1964] Milan, Italy
Design | Joe Colombo

Copyright Citation |
Mini-Kitchen [1964] Joe Colombo in Ellisheva Levi, "Room in a Box: the Intrigue with Compact and Convertible Interiors," Architectural Record 189 no. 9 (Aug. 2001): 92; PhotoCrd: Studio Joe Colombo, Mila

1970S

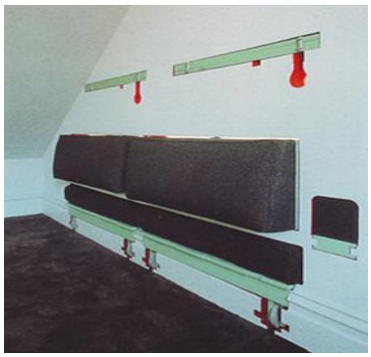
Title | **Interlubke Advertisement**
Credit | NA

Sleeping Wall Advertisement [1972]
Design | Interlubke

Copyright Citation |
Sleeping Wall Advertisement [1972] Interlubke; *Interior Design* 43 no. 4 (Apr. 1972): 99; PhotoCrd: NA

Figure 3.1.26 (continued)

1980S



Title | **Mattress Factory Gallery**
Credit | Courtesy of Ronald Feldman Fine Arts, New York

Living quarter for the Mattress Factory Gallery [1988] Pittsburgh, PA
Design | Allen Wexler

Copyright Citation |
Living quarter for the Mattress Factory Gallery [1988] Allen Wexler; Pittsburgh, PA in Annie Carlano and Bobbie Sumberg, *Sleeping Around : the Bed from Antiquity to Now* (Santa Fe, Seattle: University of Washington Press, 2006): 112, plate 1, 2; PhotoCrd: Courtesy of Ronald Feldman Fine Arts, New York

1990S

Title | **The Parraton Apartment**
Credit | Stephen Varady

The Parraton Apartment [1992] Sydney, Austrailia
Design | Stephen Varady

Copyright Citation |
The Parraton Apartment [1992] Stephen Varady; Sydney, Austrailia in Jonatahn Bell, "Building Ideas," *AD: Architectural Design* 70, no. 4 (2000): 81; PhotoCrd: Stephen Varady

Figure 3.1.26 (continued)

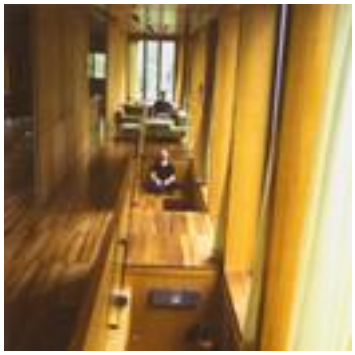
2000s

Title | **Prada Showroom**
Credit | Office for Metropolitan Architecture

Prada Showroom [2001] New York, NY
Design | Rem Koolhaas

Copyright Citation |
Prada Showroom [2001] Rem Koolhaas; New York, NY in John Pile, *A History of Interior Design* (Hoboken, NJ: Laurence King Publishing Ltd., 2005), 428, figure 21.33; PhotoCrd: Office for Metropolitan Architecture

2000s



Title | **Suitcase House**
Credit | Gary Chang,

Suitcase House [2001] Hong Kong, China
Design | Gary Chang

Copyright Citation |
Suitcase House [2001] Gary Chang; Hong Kong, China in Arian Mostaedi, *Great Spaces: Flexible Homes* (Barcelona, Spain: Page One Publishing Private Limited, 2006), 94; PhotoCrd: Howard Chang, Gary Chang

Figure 3.1.26 (continued)

2000s

Title | **Machine for Living**
Credit | Tom Powel

Machine for Living [2001]
Design | Toland Grinnell

Copyright Citation |
Machine for Living [2001] Toland Grinnell in Ellisheva Levi, "Room in a Box: the Intrigue with Compact and Convertible Interiors," Architectural Record 189 no. 8 (Aug. 2001): 90, 91; PhotoCrd: Tom Powel

2000s

Title | **Leslie Hoffman's Residence**
Credit | Radek Kurzaj

Leslie Hoffman's Residence [2003]
New York, NY
Design | Leslie Hoffman

Copyright Citation |
Leslie Hoffman's Residence [2003] Leslie Hoffman; New York, NY in Marisa Bartolucci, *Living Large in Small Spaces* (New York: Harry N. Abrams, Inc. Publishers, 2003), 114, 115; PhotoCrd: Radek Kurzaj

Figure 3.1.26 (continued)

2000s

Title | **Private Residence**
Credit | Michael Freeman

Private Residence [2004] Hokkaido, Japan
Design | Yoshio Maruyama

Copyright Citation |
Private Residence [2004] Yoshio Maruyama; Hokkaido, Japan in Michael Freeman, *Space: Japanese Design Solution for Compact Living* (New York: Michael Freeman, 2004), 206, plate 1,2,3; PhotoCrd: Michael Freeman

2000s

Title | **Nendo House**
Credit | Nacasa & Partners

Drawer House [2004] Tokyo, Japan
Design | Nendo

Copyright Citation |
Drawer House [2004] Nendo; Tokyo, Japan in Arian Mostaedi, *Great Spaces: Flexible Home* (Barcelona, Spain: Carles Broto I Comerma, 2006), 203; PhotoCrd: Nacasa & Partners

Figure 3.1.26 (continued)

2000s

Title | **Gary Chang's Apartment**
Credit | Marcel Lam for The New York Times

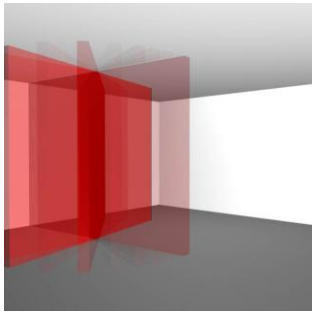
Gary Chang's Apartment [2006] Hong Kong, China
Design | Gary Chang

Copyright Citation |
Gary Chang's Apartment [2006] Gary Chang; Hong Kong, China in Virginia Gardiner, "24 Rooms Tucked into One," *New York Times,* January 15, 2009, Home and Garden section, New York edition; PhotoCrd: Marcel Lam for The New York Times
http://www.nytimes.com/slideshow/2009/01/15/garden/20090115_HONGKONG_index.html?emc=eta3

3.2 Pivot

InType

Pivot



Definition

Pivot describes the mechanized action of rotating, revolving or spinning planar elements about a central axis within an interior space or turning entire in-tact rooms. Pivot may be further characterized by scale, milieu and speed. The turning action necessitates mechanized hardware and an external force to compel the motion.

Description

This essay examines how the development of hardware for rotating and revolving has been used to transform interior spaces. A brief history of the mechanics is followed by illustrative occurrences of Pivot in furniture, wall partitions and interior environments. The development of pivot is divided into four categories; 1) pivoting walls and vertical planes, 2) pivoting casework, 3) pivoting horizontal planes, and 4) pivoting rooms and buildings.

The first type of Pivot, vertical planes, operates as threshold as well as partitioning device. When opened, the rotating wall is positioned perpendicular to the surrounding wall plane providing access to adjacent spaces. When closed, it acts as a barrier to define the volume enclosed by the unbroken planes. This type of pivot ensures privacy, visual separation, and security when needed while the seamless material treatment retains the continuity of the surface of the interior as much as possible. When one or two faces of a pivoting wall are furnished with built in casework or storage unit, it illustrates the second category of Pivot and the emphasis is on multiple uses of the space. The act of turning the plane signifies more than one functional scheme is possible by changing configuration. For example, one side of the wall can contain a kitchenette, while the other side houses a Murphy bed. The room can thus be a dining area or a bedroom depending on the side of the pivoting casework facing the occupant.

A horizontal plane in motion, the third type of Pivot, is useful when partial rotation of the floor area is desired. For example, some theater stages and showrooms employ a turning mechanism within the floor area because the audience needs to remain static while the performance or the product being shown was in motion. Revolving restaurants utilize inset rotating floor in the form of a raceway, while the inner core remains static. The major advantage in this type of Pivot is the possibility of all-around view or access to the subject in rotation.

The fourth and final type of Pivot includes entire rooms and buildings in motion; revolving motion occurs about a central core which often houses

mechanical service pipes. From the exterior, the entire structure appears to rotate as one component. The goal of building Pivot is to offer visual access to surroundings at different vantage points, while fully operational as a house or a commercial building. Patrons or occupants experience the changing view on peripheral space, while the service component remains static in order to access HVAC and electrical systems usually positioned at the center.

Early inventors of the late 1800s to early 1900 primarily used a combination of springs, latches, gears, and casters or ball bearings to maneuver pivoting casework and rotating spaces. The key mechanical part to horizontal rotational motion is a ball bearing ring. The origin of this mechanism dates back to the 15th century, when Leonardo de Vinci invented the concept of the bearing. His sketch reveals how friction between two moving parts can be minimized through the ring-shaped connector and inside the ring, balls are equally separated.[36] In the 1600s, Galileo's idea of enclosing balls in a caged wheel further improved the friction problem. The first patent for a ball race was granted to a Welsh carriage maker and inventor, Phillip Vaughan in 1791. Prior to this invention, carriage axles wore out due to friction.[37] For pivoting planes, various forms of hinges were used to provide the desired form of pivot. For example, a center-pivot plane required a different type of hinge than doors.

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[36] Charles Singer, E.J. Holmyard, A.R. Hall, and Trevor I. Williams ed. *A History of Technology*, vol. III "From the Renaissance to the Industrial Revolution" (London, UK: Oxford University Press, 1957): 327.
[37] R. P. Carlisle, *Scientific American Inventions and Discoveries: All the Milestones in Ingenuity*, (Hoboken, NJ: John Wiley & Sons, 2004): 512.

Pivot Motions Related to Furniture Types and Hardware

The pivoting motion has a long history beginning in ancient times. The earliest known form of a pivoting mechanism appeared in seating, an Egyptian folding stool (2000 to 1500 B.C). To join and enable the pivoting motion, carpenters used wooden dowels and a cylindrical peg inserted into a hole where the legs crossed.[38] Specifically for rotational motion, wheels and gears were used alone or in combination with other joineries to make complex mechanical devices that enabled desired form of movement. During the Middle Ages further development of tools and craft techniques allowed various applications of circular movement in casework that became precedent models for pivoting furniture of today.

Various forms of revolving book stands were in continuous demand since the Medieval Gothic period. The swing desk, used by monks, had a surface diagonally mounted on a metal crank pivoting in a socket. During the late fifteenth century and a growing interest in the Bible, ancient authors with the need to compare texts initiated the invention of a revolving reading desk. The polygonal or conic plane carried multiple books and swiveled as desired. The earliest example in 1485, called a Wheel Desk, revolved around a thick wooden screw. This model became a precedent for Thomas Jefferson's famous revolving book stand invented ca. 1810. (See Figure 2.2.13)

In China between 420 and 589 the first rotating bookcase was built for the purpose of housing Buddhist scriptures at temples and libraries. Called a

[38] Gisela Ritcher, *Ancient Furniture: a History of Greek, Etruscan and Roman Furniture*, (Oxford: The Clarendon Press, 1926): 13.

sutra-case cabinet, they became common by the Tang Dynasty (618-907) and built throughout China, Japan, and Korea. The wall of a sutra-case cabinet is rectangular, while the actual rotating part of the cabinet is octagonal, elaborately built in the form of a pavilion.[39]

The revolving chair emerged in the late-medieval period, towards the end of the fourteenth century.[40] In the sixteenth century, the revolving chair rapidly developed to resemble the form of the swivel office chair of the nineteenth century. In America, Thomas Jefferson introduced a Windsor style revolving chair with rotating seat that circulates on its base at his Monticello home ca. 1810.[41] (See Figure 2.2.1) In 1928, Charlotte Perriand's design of a swivel chair was included in Le Corbusier's program of "Domestic Equipment."[42] His swivel chair was innovative with its use of tubular steel and rotating upholstered cushion. (See Figure 2.2.2)

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[39] Qinghua Guo, "The Architecture of Joinery: the Form and Construction of Rotating Sutra-Case Cabinets," *Society of Architectural Historians of Great Britain*, (Lonodn, UK: Society of Architectural Historians of Great Britain and Authors, 1999): 96.

[40] Seigfried Giedion, *Mechanization Takes Command: A Contribution to Anonymous History*, (New York: Oxford University Press, 1948): 290.

[41] Silvio A. Bedini, *Jefferson and Science*, (Charlottesville, VA: University of North Carolina Press, 2002): 73.

[42] The chair is often credited to Le Corbusier, but the actually designer of the chair was Charlotte Perriand.

Figure 3.2.1 A swivel chair with rotating seat base designed by Thomas Jefferson ca. 1810.
PhotoCrd: http://www.designboom.com/history/transformer/writing.html (Accessed Apr. 17, 2010)

Figure 3.2.2 Modern swivel chair designed by Charlotte Perriand in 1928.
PhotoCrd: http://themagazine.info/products/-/266.html (Accessed Apr. 17, 2010)

The revolving door was the first type of threshold to utilize a pivoting plane. Bockhaker filed a patent for a "Draught-free Door," and in 1888, a mechanical engineer Theophilus Van Kannel called his invention a "Storm Door Structure." The inherent quality of the revolving door allowed the retention of air within the building. The revolving door quickly became a necessary apparatus in high rises for the prevention of chimney effect. The advantage was an efficient use of energy, thereby reducing the cost of heating and cooling the air. Other building types such as hotels, restaurants and department stores had revolving door as a statement of glamour and prestige. The revolving door allowed for only one person to pass at a time, making the experience of entrance a highly individual act.[43]

[43] Laurent Stalder, "Turning Architecture Inside Out: Revolving Doors and Other Threshold Devices," *Journal of Design History* 22, no. 1 (New York: Oxford University Press, 2009): 71.

The revolving door structure became the precedent of pivoting vertical planes. Similar to the revolving door, pivoting planes created compartmentalized sections that were furnished for different functions.

Casement windows are another familiar example of pivoting motion. Many windows installed in attic spaces pivot to be opened. Depending on the desired air flow, windows can pivot either horizontally or vertically. Because of their shape only circular windows or rectangular windows can be pivoted to be opened. Pivot windows were originally an early type of industrial window that became standard for warehouses and power plants.[44] During early 19th century several patents were filed on the mechanism of pivoting casement windows.

Exhibited at the 1893 Colombian Exposition in Chicago, Elizabeth Howell's "self waiting table" or more commonly known as the "lazy Susan" featured a revolving disk set into the middle of a table or placed atop a table could be laden with food and slowly turned to deliver different dishes to individual diners. The movable portion was supported upon rollers and mounted on a central pivot. Patented in 1891, the basic mechanism follows that of rotating theaters.

Pivoting Walls and Vertical Planes

Pivoting interior planes have distinct qualities and purpose within the environment. A wall or a section of a wall form boundaries or barriers between

[44] The Department of the Interior, *The Preservation of Historic Architecture: the U.S. Government's Official Guidelines for Preserving Historic Homes,* (Conneticut: The Lyons Press, 2004): 124.

spaces at one time. When pivoted, they connect to the adjacent space that renders a larger volume of unbroken space. Pivoting vertical planes enable users to have multiple room configurations

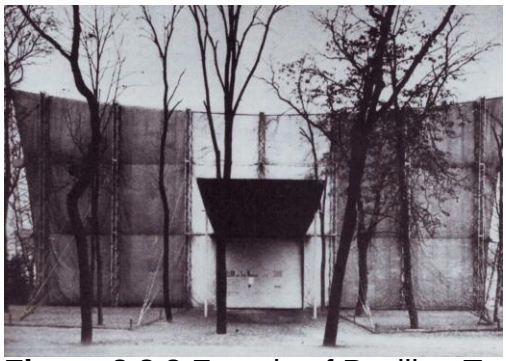
Unlike standard doors, pivoting planes do not have any visual cues such as door frame or knobs indicating of its purpose as threshold. Transformation is achieved by a simple push or nudge, or through an automated system. The fact that one does not need visible hardware to maneuver the pivoting wall provides visual continuity across the wall disguising the transformability of the space.

Depending on the quantity of sectional planes, the degree of openness can change. When a single pivoting plane is larger than the size of a typical door, a new wall is introduced into the expanded volume of space. This type of pivot is widely used in museums and gallery interiors where flexible display schemes are desired. Walls that pivot are often used for display surfaces and naturally guide circulation. The series of pivoting partitions may completely break down the physical boundary between two spaces. These turning planes become a dematerialized wall, dissolving the physical boundary that existed between the two volumes of space. Large gathering places such as auditoriums and meeting rooms utilizes this type of pivot to accommodate different quantities of people and furnishings.

Chronological Sequence for Vertical Planes

In Pavilion Temps Nouveaux (1937) and the Millowners' Association Building in India (1954), Le Corbusier used a single pivoting vertical plane with a

thickness for the entrance of a façade. Pavilion Temps Nouveaux was specially designed for the Paris International Exhibition of 1937. While the design of the overall structure is credited to Pierre Jeanneret, the façade and the pivoting entrance wall was designed by Le Corbusier. The advantage of pivoting plane provided an entrance while minimally interfering with the structure and profile of the pavilion. He also emulated the delicate curve formed by the canvas structure through the swooping curve created by the rotation.[45] Scholars speculate that the form of Ronchamp Chapel and its trapezoidal arc may have been conceived during the design process of Pavilion Temps Nouveaux. (See Figures 2.2.3 and 2.2.4)



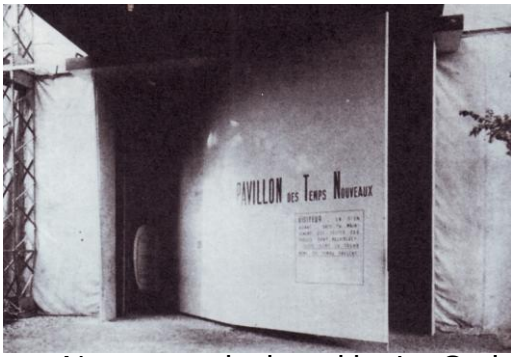


Figure 3.2.3 Façade of Pavilion Temps Nouveaux designed by Le Corbusier and Pierre Jeanneret. (1937)
Figure 3.2.4 Main entrance wall section pivoted.
PhotoCrd: The Journal of the Society of Architectural Historians, Mar. 1997, 54,55.

The pivoting motion again appeared in Le Corbusier's Millowners' Association Building in India. (1954) Le Corbusier tried to work with the climate by laying out "diagonal in-situ concrete brise-soleil of the front," which set in "opposition

[45] Danilo Udovicki-Selb, "Le Corbusier and the Paris Exhibition of 1937: the Temps Noveaux Pavilion," *The Journal of the Society of Architectural Historians* 56, n. 1 (1997): 52

to the appliqué – orthogonal sun-screening of the rear." Two different configurations of the walls at the front and back created a solution to better ventilation and sun-screening. Reconciling the walls in two different angles is the square, off-center pivoting section of the facade. When closed or opened perpendicular to its frame, the plane aligns with the orthogonal walls in the building. It could also be rotated to match the angle of the diagonal walls at the front. The thickness, materiality, and flexibility of the pivoting wall in the Millowners' Association building address the tectonic quality often present in Le Corbusier's architecture.

In terms of space economics, Pivot can yield useful space-saving configurations that effectively distinguish different functions. Michael Goodman's residential design in 1945 employed a pivot wall to transform a single room into three separate areas: a wood working shop, a work room for flower arrangement, and a living room for movie and music. The wall is angled to allow either complete or partial segregation. The edge of the pivoting partition can be aligned with the static perimeter wall to define and respect the distinct function of each space. (See Figure 2.2.5) It was a unique design solution that specifically catered to the resident's life style, while relieving limitation of given square footage.

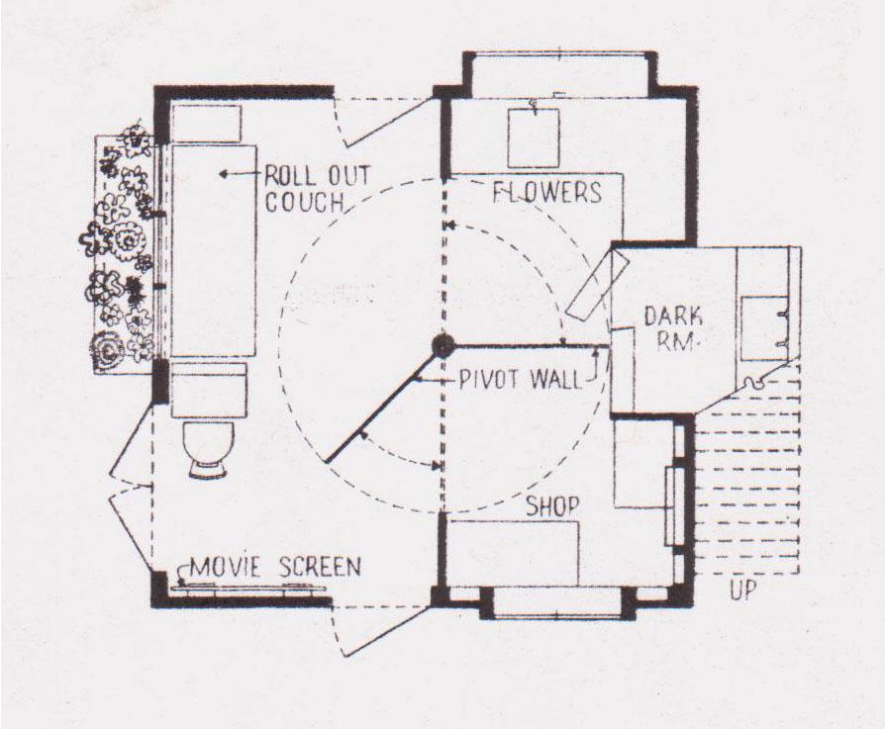


Figure 3.2.5 Floor plan of a section of a residence designed by Michael Goodman. (1945) Angled Pivot wall at the center can be rotated. PhotoCrd: Architectural Forum, Apr. 1945, 97.

Towards the late 20th century, creative designers in Manhattan, New York started to recognize Pivot as a design strategy. Real estate situations in the city often meant limited office space. Faced with this prevalent problem, design principals Paul and Barbara Haigh for Haigh Space decided to co-habitat on a floor with graphic design firm, while sharing a reception zone and a conference room. These two rooms were identical in size and were conjoined or divided by a pivoting wall. (See Figures 2.2.6 and 2.2.7) Thus two spaces were connected or separated to support the nature of gathering. The L-shaped wall moved, “swinging on rubber wheels, to fit neatly in front of one of the side walls.”[46] The wall was constructed of a honeycomb core to make it light and moveable.

[46] Edie Lee Cohen, “Haigh Space, New York,” *Interior Design* 58, no. 7, (1987):

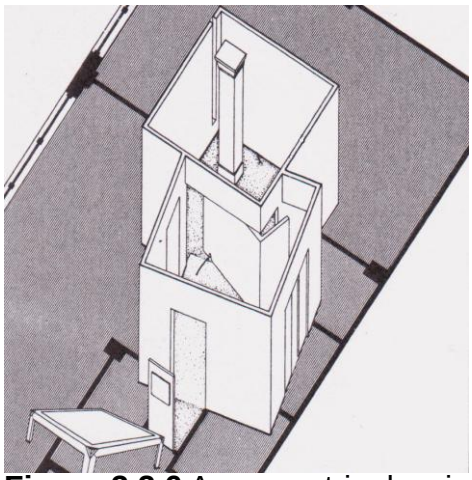



Figure 3.2.6 Axonometric drawing of the reception and conference room of Haigh Space by Haigh Design. (1987) Note L-shaped wall in the middle turned half way in the illustration.
Figure 3.2.7 The time-release motion of swinging wall is captured. PhotoCrd: Interior Design, May 1987, 304, 305.

Osgood & Associates (1990) also utilized Pivot to offset the square footage limitation, while enhancing their firm's identity. What divides the reception area from conference rooms are full-height, orange (the color representing the firm) turning panels posing as a wall through "a contiguous alignment of individually operable doors."[47] (See Figures 2.2.8 and 2.2.9) When privacy is needed in the conference rooms, the panels are closed providing a solid back drop for the chaise lounge chair and the art work.

304.
[47] Monica Geran, "Osgood & Associates," *Interior Design* 61, no. 10, (1990): 147.

Figure 3.2.8 Conference rooms through reception area at Osgood & Associates. (1990) Pivoting panels fan outward opening up to the reception area.
Figure 3.2.9 Closed to form a contiguous elevation of orange.
PhotoCrd: Interior Design, Jul. 1990, 148.

The storefront to Art and Architecture, a non-profit gallery dedicated to showing art and architecture to the public employed Pivot. Architect Steven Holl and Artist Vito Acconci collaborated to create a provocative front for the gallery by blurring the boundary of interior and exterior. The storefront is a 90-foot gray concrete wall that resembles “a bunker.” At noon, geometric-shaped panels pivot in horizontal and vertical directions out to the sidewalk. Not taking any literal form, panels give minimalist abstract impression to be freely explored by the viewers. They can be used for a bench on which to sit, a display stand or an element to redirect the wind. From inside the gallery, the pivoted panels divide space. Some people may view them as “blunt, out-of-scale, and claustrophobic,” while others may think of them as engaging, curious, and interactive.[48]

[48] Peter Slatin, “Holl and Acconci Reface Stroefront,” *Architecture* (Jan. 1994): 23.

Figure 3.2.10 Left shows Storefront for Art and Architecture designed by Steven Holl and Vito Acconci from street side. (1994) Pivoting planes open up at Noon of the day. Right is a view taken from the inside. Pivoted planes define the physical characteristic of space with the permanent wall.
PhotoCrd: Architecture, Jan. 1994, 23

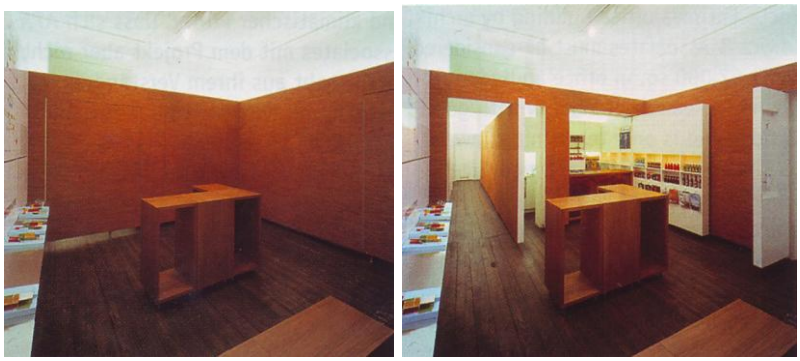


Figure 3.2.11 Salon space for Blauraum Architekten. (2004) Center-pivoting and edge pivoting walls reveal corridor space and kitchenette.
PhotoCrd: AIT: Architektur Innenarchitektur Technischer Ausbau, Oct. 2002, 178.

Pivoting interior walls at the Blauraum Architekten office and salon (2004) also demonstrate dual usage through transformative configuration. The salon, a gallery with kitchenette, is a multifunctional space for employees as well as guests. “Office staff and Salon visitors mingle in the corridor, producing a creatively-stimulating overlap of work and play.”[49] The cork-faced walls form a closed cube. A hinged wall section reveal a kitchenette and snack bar, while center-pivoting wall section opens up to adjacent office spaces such as

[49] Arian Mostaedi, *Great Spaces: Flexible Homes*, (Barcelona, Spain: Carles Broto I Comerma, 2006): 136.

conference room and plotter space. The wall becomes a long corridor that leads the traffic flow into office space. (See Figure 2.2.11)

Museum of Tolerance in Los Angeles (2009) designed by Yazdani Studio used Pivot as means to have an ever-changing configuration free of reference to adjacent walls. The Youth Action Lab, an open area with floor-to-ceiling light boxes and sponge chairs feels like a playground rather than museum. The pivoting light box is made of an acrylic panel sandwiching a flat screen monitor and vinyl film that has colorful texts about people who contributed to world peace. The turning of these light boxes adds a playful and spontaneous air as well as flexible circulation layouts as a way to curate versatile museum experiences.[50] (See Figure 2.2.12)

Figure 3.2.12 Youth Action Lab of Museum of Tolerance designed by Yazdani Studio. (2009) Light box walls pivot to create different plan figure.
PhotoCrd: Interior Design, May 2009, 142.

[50] Craig Kellogg, "Harmony and Understanding," *Interior Design* 80 no. 7 (May 2009): 142-144.

Pivoting Vertical Casework

Compared to pivoting vertical planes, rotating casework is more focused on the multiple functionality it provides. For example, a single center-pivoting plane may be furnished on one or both sides with shelves and/or cabinets for storage. Each side houses articles for a particular function, such as dining, entertaining or sleeping. Then there is a centrifugal pivoting wall with casework attached, in which more than two planes stem out of a central axis. In this case, transforming options multiply. Early examples show furniture pieces anchored to a pivoting wall, which focused on the concealment of the furnishings. Pivoting vertical casework evolved to be integrated within the connecting structure rather than an attachment to pivoting vertical walls.

Chorological Sequence for Pivoting Casework

The concept of making planar surfaces useful emerged during the eighteenth and nineteenth centuries. Industrial revolution changed the world and demand for efficiency and mechanization of the interior became an interest among inventors, architects, and designers. Inspired during his stay in France as an US ambassador, Thomas Jefferson employed several innovative pivoting apparatuses to the furniture and interior at his Monticello home. One example was his revolving bookstand which exhibited multiple books at one time. (See Figure 2.2.13) The “Turning Buffet” represented another illustration of Jefferson’s fascination with transformative casework. One side of the plane was furnished with shelves and cupboards for trays, dishes, and glasses while the other side portrayed an ordinary colonial style door. “By touching a spring they turned into the room loaded with the dishes placed on them by servants

outside the wall." The room also had a fireplace housing a dumbwaiter for wines.[51] (See Figure 2.2.14)

Figure 2.2.13 Revovling book stand designed by Thomas Jefferson. (c. 1810) As many as five books can be placed at one time.

Figure 2.2.14 Revolving Serving Door, referred as "Turning Buffet" at Thomas Jefferson's Monticello residence. (c. 1810)
PhotoCrd: Jefferson Encyclopedia,
http://wiki.monticello.org/mediawiki/index.php/Revolving_Bookstand
http://wiki.monticello.org/mediawiki/index.php/Revolving_Serving_Door
(Accessed Apr. 19, 2010)

The first commercial application of a fully pivoting wall furnished on both sides appeared in Earl Tate's Combination Furniture Structure (1914). The pivoting motion happened at the edge of the structure, furnished with storage casework on both elevations. When Tate's Furniture Structure with the folding bed façade was presented, the room became a bedroom. Similarly, when the opposite side became accessible, which contained cupboards and a folding table, the space was transformed into a dining room. The entire structure moved on a ball bearing raceway set into the floor.[52] (See Figure 2.2.15)

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[51] Silvio A. Bedini, *Jefferson and science*, (Charlottesville, VA: University of North Carolina Press, 2002): 72.

[52] Earl H. Tate, *Combination Furniture Structure*, US Patent 1122170, filed

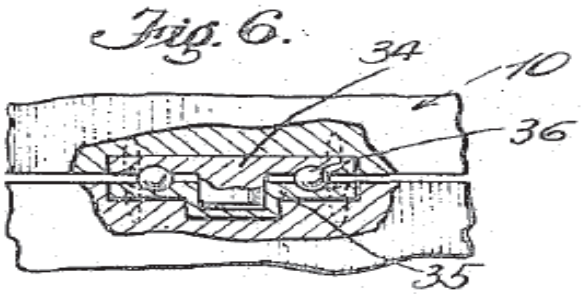

Figure 2.2.15 Sectional view showing form of ball-bearing used in Earl Tate's design.
PhotoCrd:
http://www.google.com/patents?id=22tIAAAAEBAJ&dq=Earl+Tate+1914
(Accessed Dec. 14, 2009)

With a similar mechanism in 1918, Pasquale Cimini expanded the idea and developed the Revolving Platform for Apartment Furniture, a more complex version of cross-partitions pivoting about a central standpipe. The advantage of cross-partitions was that one space could be divided into four different functions, and pivoted according to the need of the occupants. Kitchenette, dresser, bed, and closet sections are available at each turn. The stand pipe in the center pivoted by motion transmission device comprised of latches and gears.[53] (See Figure 2.2.16)

June 8, 1912, issued on December 22, 1914.
http://www.google.com/patents?id=22tIAAAAEBAJ&dq=Earl+Tate+1914
(Accessed Dec. 14, 2009)

[53] Pasquale L. Cimini, *Revolving Platform for Apartment Furniture*, US Patent 1278108, filed December 12, 1916, issued on September 10, 1918.
http://www.google.com/patents/about?id=AFhcAAAAEBAJ&dq=Cimini
(Accessed Dec. 14, 2009)

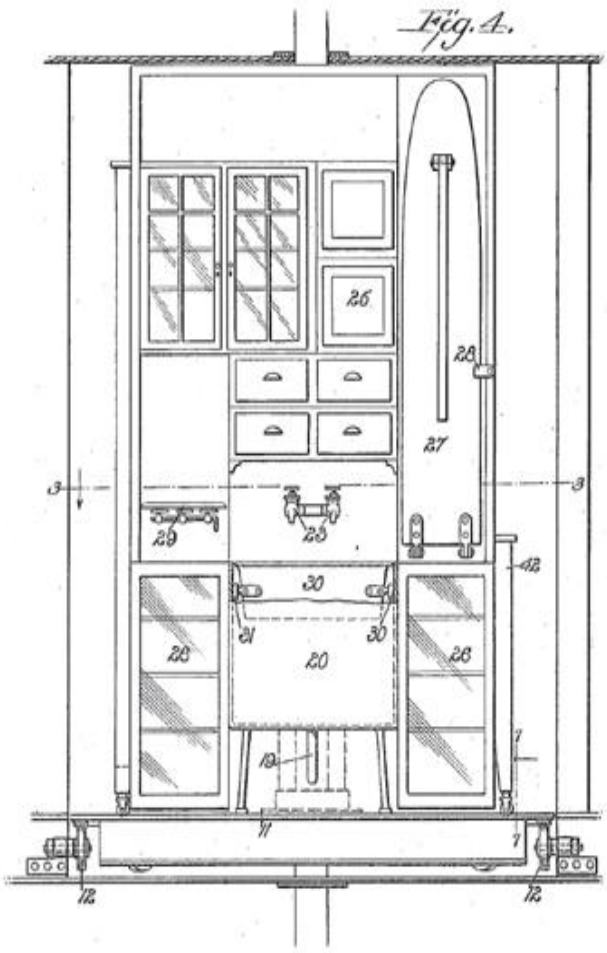

Figure 3.2.16 Early example of Pivot by Pasquale Cimini. The platform (number 11) is supported on rollers (number 12) to which movement may be passed on by motion-transmission apparatus. This mechanism can be powered by either a hand crank or a motor.
PhotoCrd:
http://www.google.com/patents/about?id=AFhcAAAAEBAJ&dq=Cimini
(Accessed Dec. 14, 2009)

Pivoting apparatus in the early twentieth century utilize the pivot mechanism to connect the casework to the ceiling and the floor. The hardware for the top pivot contains a ball bearing raceway, wheels, and a small rod-like hinge to secure the structure in place.

Prevailing penchant for function and aesthetic at the same time, pivoting apparatuses further developed in the 1960s to reflect the demand of a modern era. Italian designer, Joe Colombo, known for a series of small transformative product designs such as the Mini-Kitchen (1963) and the Total Furnishing Unit (1972), expanded this concept to create multifunctional furniture which augmented interior space. “Roto-Living” (1965) utilized a pivoting mechanism to revolve two planar casework sections and modify the object’s utility. One side was equipped with containers, shelves, a stove and table for dining; the other side promoted entertaining and contained a television set, radio, hi-fi system and a bar. Roto-Living was pivoted by electric power to alter the space promptly without physical effort by the occupant.[54] (See Figure 2.2.17)

Figure 3.2.17 Joe Colombo’s concept sketch of Roto-Living. Central component rotates as indicated by arrows.
PhotoCrd: Ignazia Favata, Joe Colombo : and Italian design of the sixties (Cambridge, Mass. : MIT Press, 1988) 16.

Figure 3.2.18 Manufactured by ICF, a bookcase turns to reveal a Murphy bed.
PhotoCrd: Interior Design, Apr. 1972, 99.

In 1972, the European ICF furniture line showcased a living room storage

[54] Emilio Ambasz, *Italy: The New Domestic Landscape*, (New York: The Museum of Modern Art, 1972) 106.

system.[55] What was unique about their wall module, 'Sleeping Wall,' was that the built-in bookcase could be pivoted to reveal a Murphy bed. (See Figure 2.2.18)

Pivoting Horizontal Planes

Like pivoting walls and vertical planes, revolving floors and turntable platforms have evolved over time. The key to moving horizontal plane is the contrast between rotational action and the static spatial entities. The juxtaposition of these motion and non-motion elements in the same space achieves the desired effect. Pivoting horizontal planes are either a disc platform, or a wide race way in shape of a ring. The disc platform may have casework and a wall that aligns with the host structure, turned at specified time to accommodate the program of the larger space. For example, a turntable at a lecture hall turns to reveal a different set up for the subsequent class. The raceway platform is most commonly found in revolving restaurants. The area of rotation is reserved for patrons and is typically furnished with dining furniture without any walls. Thus the area of the raceway becomes a distinguished space with an open plan. Curved partitions may appear at the edge of the inner radius to differentiate itself from the static section.

Chronological Sequence for Horizontal Planes

The first revolving stage in the West appeared in 1896 when Karl Lautenschlager built 'Munich Revolver.' It was supported by a complex understructure fitted with rollers which ran on a circular track two levels below

[55] ICF Source Furniture for Office and Home, "History," ICF Sources Furniture, http://www.icfsource.com/

the stage floor. The turning mechanism was powered by electricity.[56] The first American revolving stage is credited to Bishop, who developed a permanent revolving stage with architect Edward T. Foulkes for Ye Liberty Theater, California in 1903. The turntable rested on casters, supported by four steel beams attached to a base which revolved on rollers. Stage hands pushed the beams underneath the stage and walked the table around until next scene appeared in front of the audience.[57] Revolving stages in theaters utilized man power as well as electric motors.

Although a short lived instance, the rotary jail was one of the earliest conventional horizontal plane structures built in the United States. All rotary jails were based on the 1881 invention and patented design of W.H. Brown. A sharp increase in mob violence after the Civil War necessitated more creative solutions for jail construction. Escape - proof prisons and cells in constants motion was the government's solution. Rotary jails offered minimum personal contact or no contact with inmates given the successful operation of the structure.[58] Prisoners were incapable of gaining an access to any kind of exit or communicate with other prisoners. Walter A. Lunden was the first to study these structures. Revealing the workings of the extinct incarceration model in detail, Lunden noted that:

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[56] Wendell Cole, "America's First Revolving Stage," *Western Speech* 27 no. 1 (Winter 1963): 36-37.
[57] Wendell Cole, "America's First Revolving Stage," *Western Speech* 27 no. 1 (Winter 1963): 38.
[58] Walter A. Lunden, "The Rotary Jail, or Human Squirrel Cage," *The Journal of the Society of Architectural Historians* 18, no. 4 (Dec., 1959): 149-157.

> The inner cylinder is constructed around a central axis which rests on bearings at base with a supporting collar in the third floor. There is one door at each level in the outer shell. Each cell in the inner drum has a doorway but no door. Entrance is gained to respective cells by rotating the inner platform with radial cells opposite the single door in the gridded stationary outer shell. At the core, an access to toilet and water pipes, air shafts are present. Rooms around the revolving cells are exercise rooms and runways. Continuous rotation was made possible by the means of a heavy weight or spring, the operation of which could be regulated by clock work or other similar mechanism.[59] (See Figure 2.2.19)

The rotary jail was an innovative architecture in response to an immediate social crisis. Although rotary jails failed to prove its mechanism suitable for longevity, it paved the way for rotating rooms and buildings.

[59] Walter A. Lunden, "The Rotary Jail, or Human Squirrel Cage," *The Journal of the Society of Architectural Historians* 18, no. 4 (Dec., 1959): 150.

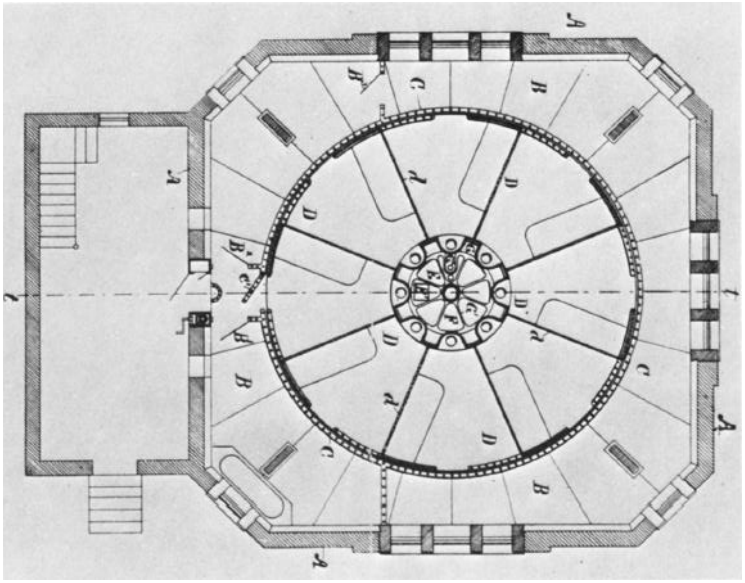

Figure 3.2.19 Plan of rotary jail in Patent of 12 July 1881 by W.H. Brown. PhotoCrd: W. H. Brown & B. F. Haugh, *Jail or Prison*, US Patent 244358, filed April 12, 1881, issued on July 12, 1881. http://www.google.com/patents?id=yD9JAAAAEBAJ&pg=PA1&dq=rotary+jail&source=gbs_selected_pages&cad=2#v=onepage&q=rotary%20jail&f=false (Accessed Jan. 23, 2010)

In the 1930s, industrial designer Norman Bel Geddes created a circular garage with rotating floor to allow drivers to enter and exit through the same opening.[60] Published in Ladies' Home Journal (1932), House number 3 featured a turntable garage that blurred the line between structure and machine.[61] A rotating platform in residential garages became popular among those who could afford it.

The Rainbow Room on the 65th floor of Rockefeller Center (built in 1934 and renovated in 1988) has long been a landmark interior. Started as a formal supper club of New York's elite society, it is famous for the skyline, a live band

[60] "Stage Challenges Movies with Revolving Settings," *Modern Mechanix* (Sep. 1931): 87.

[61] Norman Bel Geddes, *Horizons* (Boston: Little Brown, 1932): 105.

orchestra, and a revolving dance floor. The drama and magical atmosphere heightened with the 32 feet diameter of revolution at one foot per minute. Dancers had ever-changing view of the room and of New York City. Around the stage was tiered seating to insure that there is not a bad seat in the house.[62] The renovation led Hardy Holzman Pfeiffer to focus on preserving essential elements that signified the reputation of the Rainbow Room, such as the dance floor in motion. (See Figure 2.2.20)

Figure 3.2.20 Rainbow Room at the Rockefeller Center (1988) renovated by Hardy Holzman Pfeiffer. The circular dance floor slowly revolves as shown in the photos.
PhotoCrd: Interiors, Jul, 1992, 23.
Interior Design, Jun, 1988, 243.

Upon the availability of postwar technology, the turntable mechanism coupled with appearance of tall towers led to the wide spread popularity of revolving restaurants atop of buildings in the mid- to late-1900s. Tall towers with revolving restaurants created city landmarks that symbolized progress and prosperity. Rotating restaurants with breathtaking exterior views pioneered themed entertainment dining, where people were willing to pay higher prices

[62] Edie Lee Cohen, “Rainbow,” *Interior Design* 59 (Jun. 1988): 242.

for food if it included a new amusement.

The mechanism for revolving restaurants was applied to maximize the view. On top of wheels, taking a form of a wide raceway, the turntable of the revolving restaurant occupied an outer part of a floor plate of the host structure. Kitchen and service sectors were positioned in the static core. The dining area floor was the only component in motion which allowed the inactive parts to provide operational support and vertical circulation.[63]

The first revolving restaurant built in the United States was built by John Graham, a Seattle architect and acolyte of Buckminster Fuller. La Ronde (1961) was on the top of the tallest office building at the time, Ala Moana Shopping Center in Honolulu. The72-foot wide restaurant was cantilevered from a thirty-eight foot diameter concrete core which contained stairwells, elevators, the kitchen and other facilities for the restaurant.[64] Operated by a three horse power motor, the structure made a 360-degree turn every hour. In the following year, Graham repeated the revolving restaurant concept at the Seattle Space Needle for the 1962 World Fair.

[63] Restaurant Manager at The View Restaurant, Marriott Marquis, telephone interview with the author, June 22, 2010.

[64] "Restaurant Perches Atop Building," *New York Times*, November 26, 1961.

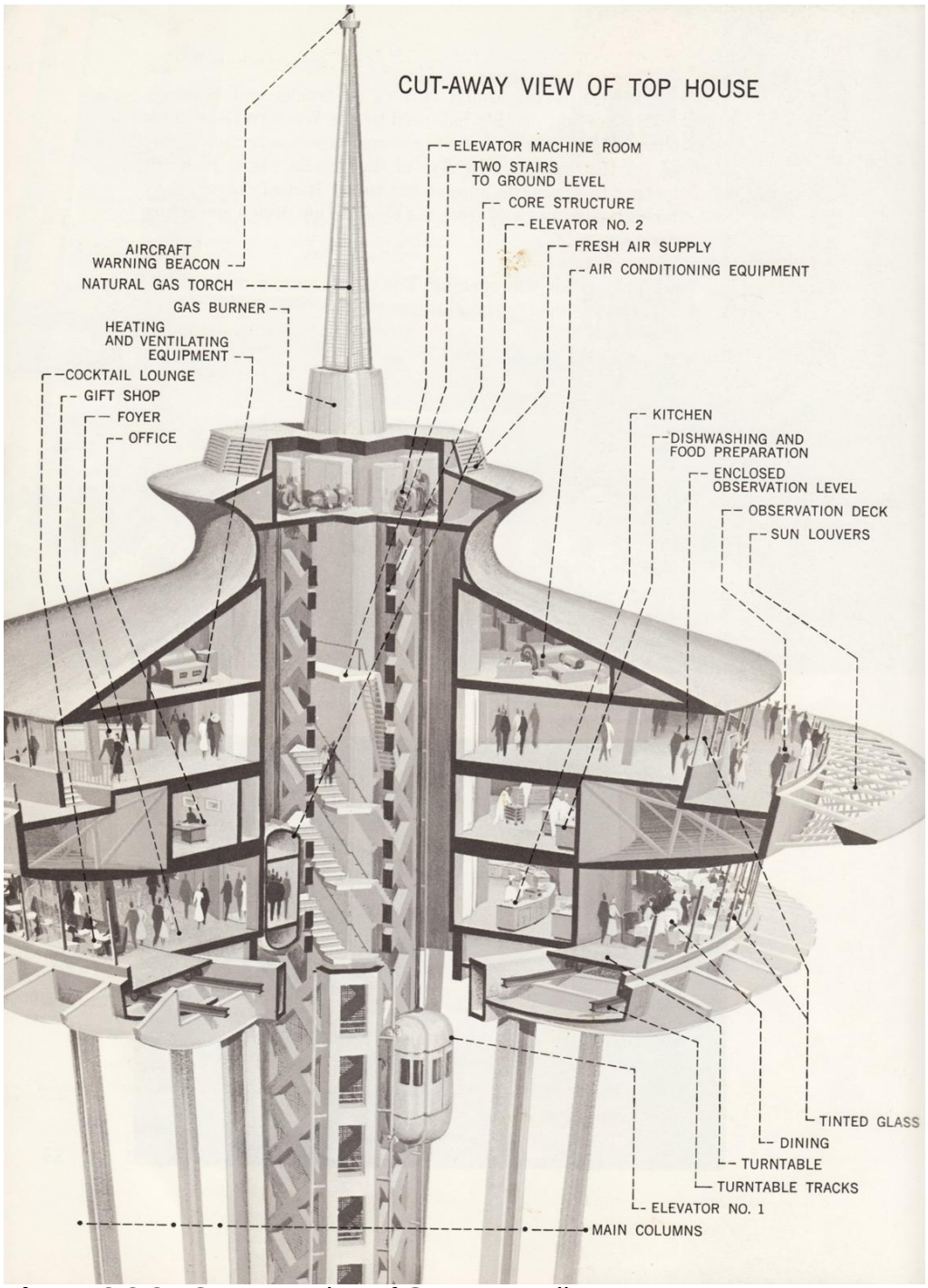

Figure 3.2.21 Cross section of Space Needle restaurant.
PhotoCrd: http://www.vintageseattle.org/wp-content/uploads/2008/05/space_needle_cut_01.jpg (Accessed Apr. 23, 2010)

The Space Needle represented the foremost technology of Space at the exhibition. Constructed in 1962, “Eye of the Needle,” now called Sky City Restaurant, sat on top of the 600 foot steel structure. It is a circular, glass-encased restaurant whose floor rotates 360-degrees every hour. The restaurant turntable revolves on a track and wheel system that weighs roughly 125 tons and was borrowed from railroad technology.[65] It takes a one and a half horsepower motor to make the turntable floor revolve. With international exposure and publicity of the tower, the Eye of the Needle catalyzed the national enthusiasm about revolving restaurants, which were launched in every major cosmopolitan city in the United States.[66] (See Figure 2.2.21)

Many cities around the world started building towers of great heights. In 1976 the Canadian National Tower in Toronto was designed by architects Francesco and Aldo Piccaluga. A revolving restaurant and a pool lounge were added to what had been a simple telecommunications tower. At a height of 1150 feet and with seating capacity for 490 people, the restaurant rested on a revolving ring platform, 137 feet in diameter on three levels. The motion encompassed tiered seating around the stationary central core, which contained the kitchen, services area, and the entrance lobby.[67] (See Figure 2.2.22)

The View restaurant on the 45th floor of Marriott Marquis Hotel (1986) in New

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[65] Space Needle Official Website, “Discover the Needle,” Space Needle LLC, http://www.spaceneedle.com/discover/funfacts.html (Accessed Mar. 6, 2010)
[66] Anonymous, “Century 21: Seattle World’s Fair,” *Interior Design* 33 no. 3 (Mar. 1962): 132 - 135
[67] “Toronto CN Tower: Un Grande Ristorante Girevole,” *Domus* 586 (1978): 38-40.

York City provided a panoramic view to skyscrapers such as the Chrysler Building and the Empire State Building along with more than twenty other famous buildings surrounding the hotel. The mechanism relies on the turntable on rubber wheels attached to the platform. Only the dining tables, chairs and banquettes move along with the floor. The floor turns at a rate no faster than one complete cycle in an hour.[68] To maximize the effect, the central service wall is treated with a reflective surface to duplicate the view of the skyline. (See Figure 2.2.25)

Figure 3.2.22 360 Restaurant at the Canadian National Tower (1976) in Toronto by Architects Francesco and Aldo Piccaluga.
PotoCrd: Domus Sept., 1978, 38.

Figure 3.2.23 The View at Marquis Marriott Hotel in New York City designed by Architect John Portman.
PhotoCrd: Restaurant and hotel design Sept., 1986, 40.

"In 1968, Business Week reported that the Hyatt hotel chain, prompted by the success of its Polaris restaurant in Atlanta, would build a revolving platform restaurant atop every new hotel."[69] The revolving restaurant became a tourist attraction of each particular city as Hyatt hotels continued to build one after

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[68] Mickey Steinberg, Senior Advisor to the Chairman at Portman Holdings, e-mail message to the author, June 28, 2010.
Restaurant Manager at The View Restaurant, Marriott Marquis, telephone interview with the author, June 22, 2010.

[69] Tom Vanderbilt, "Talking About A Revolution," *Metropolis* 18 (1998): 87.

another during 1980s and 1990s. Atlanta's restaurant at the top of the Hyatt Hotel (1985) by Eakin Architects continued the typology of a rotating raceway with tiered seating arrangement. Antares Restaurant at the Hyatt in Dallas (1993) designed by Deborah Lloyd Forrest attempted to heighten the experience of rotating on the top by "relating the interiors to the sky, clouds, and heavens above."[70] Lighting fixtures were in the shape of stars and moons against tufted walls. "The dining sector was divided into four vibrant color coded quadrants to help guests and staff to find their revolving destinations."[71] (See Figures 2.2.22 and 2.2.23)

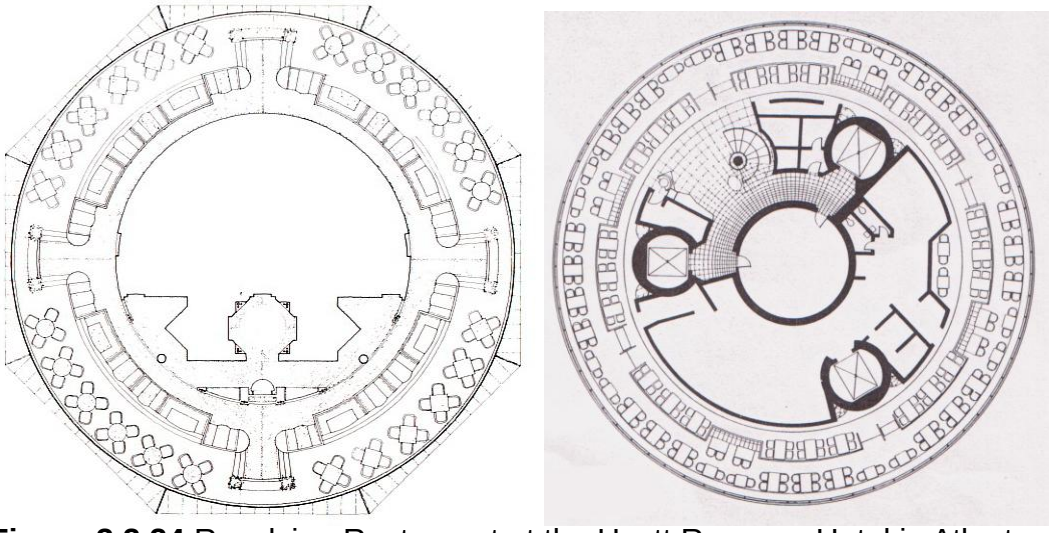

Figure 3.2.24 Revolving Restaurant at the Hyatt Regency Hotel in Atlanta (1985) designed by Eakin Architects. The outer ring with dining tables rotates.
PhotoCrd: Chicago Architectural Journal v. 5, 1985, 97.

Figure 3.2.25 Antare, a revolving restaurant at the Hyatt Hotel in Dallas (1993) designed by Deborah Lloyd Forrest. Tiered seating and tables rotate on the turntable platform.
PhotoCrd: Interior Design Jun., 1993, 138.

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[70] Mayer Rus, "Deborah Lloyd Forrest," *Interior Design* 65, no. 6 (Jun. 1993): 138.

[71] Mayer Rus, "Deborah Lloyd Forrest," *Interior Design* 65, no. 6 (Jun. 1993): 138.

The mechanism for pivoting horizontal planes was not only limited to entertainment venues or themed restaurant. James S. McDonnell Hall at Princeton University (1998) designed by architect Charles Gwathmey of Gwathmey Siegel Architects featured a lecture space on a turntable. A demonstration or experiment can be set up on one side while another is being performed.[72] The platform can be automatically turned 180-degrees at the push of a button. Manufactured by Macton, the oldest turntable manufacturer, the company cites over 30 higher education institutions that are equipped with lecture hall turntables. Macton also manufactures customized turntables for residences where rotation is desired for exterior view or flexible arrangement of furniture. (See Figure 2.2.26)

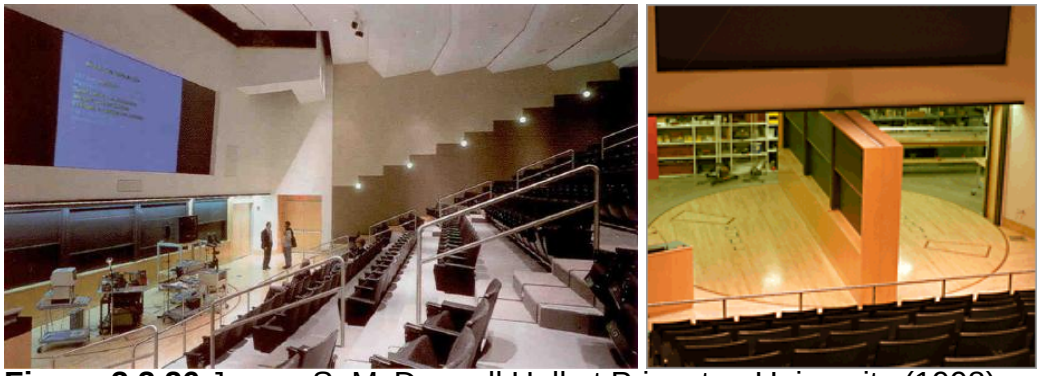

Figure 3.2.26 James S. McDonnell Hall at Princeton University (1998) designed by Architect Charles Gwathmey. The left shows overall view of the lecture hall. The right shows turntable rotated at 90 degrees.
PhotoCrd: Architectural Record, Oct. 1998, 152.
Macton, "Lecture Hall Turntables," http://www.macton.com/turntables/lecture-hall.htm (Accessed June 16, 2010)

Located in Curitiba, Brazil, the Suite Vollard desgined by Bruno De Franco Arquitetura com Alma is the first kind of revolving apartment. The firm

[72] Kira L. Gould, "James S. McDonnell Hall, Princeton University," *Architectural Record* 86 (Oct., 1998): 151.

patented their design for ‘Rotating System for Building in General’ in 2006. A spinning metallic platform rolls over a rigid concrete structure. The glass walls rotate together with the platform which minimizes the disorienting sense of movement, which may be advantageous in residential environment. The roof may rotate together with the structure in the patent, but the Suite Vollard features an annular floor plate with glass window in motion. Housed within the larger concrete structure, each apartment can rotate individually in any direction. The annular ring is the rotating platform with an inner circular space housing bathroom and kitchen. Other parts of the house are accessible by peripheral corridor. A control system is available from the inside, which residents can manipulate to control speed, duration, direction, and timing of the rotation. (See Figures 2.2.27 and 2.2.28)

The floor plan is a composite of three distinct parts: a static rectangular space which contains vertical circulation, a veranda in the form of a disc, and a static round core to house the bath and kitchen. The turntable rotates within the circular space with an encompassing corridor for circulation on the outer radius. There is no wall or partition on the rotating platform, and each space is defined alone by furniture groupings. The static circulation path that surrounds the rotating floor conveniently connects to the fixed vertical circulation of the building. One primary benefit achieved by this design is the visual fluidity across the space allowing maximum exposure to the exterior view and extending the perceived physical boundary to infinity. The landscape seen from inside becomes a framed panoramic landscape for personal viewing and enjoyment.

Figure 3.2.27 Exterior view of the Suite Vollard desgined by Bruno De Franco Arquitetura in 2009.
Figure 3.2.28 Floor plan of a single apartment unit. The annular ring shaded in yellow is the rotating platform.
PhotoCrd: Atlas of Architecture: Urbarama, "Suite Vollard," http://pt.urbarama.com/project/suite-vollard (Accessed Jun. 22, 2010)

Pivoting horizontal planes and turntables have been in demand throughout the mid 20th century and remain a building type in use today. During 1970s and 1980s, revolving restaurants were built in major cities across the United States. During 1990s, international metropolitan cities followed suit.[73] Besides restaurants, theater, educational institutions and residences, many rotating structures were also applied to manufacturing or showcase purposes in the automobile industry. Motor shows and automobile showrooms are the most common retail interiors to utilize turntables for showcasing their products.

[73] Tom Vanderbilt, "Talking About A Revolution," *Metropolis* 18 (1998): 73-75.

Pivoting Rooms and Buildings

Pivoting rooms and buildings appeared in the early 1900s as architects and structural engineers developed the means to achieve full rotation of a space in larger scale. Whereas pivoting horizontal planes encompass the sectional rotating floor of a larger building free of partitions, pivoting buildings manage to revolve the whole structure including rooms and sometimes multiple levels. Except for vertical circulation which remains stationary, the entire floor area rotates. Walls and partitions stretch centripetal towards inner core, yielding pie-shaped rooms. Inside the pivoting building, the occupant hardly detects the movement. Only the changing view as seen through curved glass envelope suggests the passage of time. Examples are dominated by residential interiors with fully functional rooms and utilities.

The intent for rotation is more personalized compared to the other types of Pivot. For example treating illness by exposure to sunlight and having personal and private enjoyment of the exterior view drives the design and structure of the building. The entire structure rotates as one component, which grants an access to peripheral observation at every vantage point within the space during the revolution.

<u>Chronological Sequence for Rooms and Buildings</u>

During the mid-nineteenth to the mid-twentieth century, new architectural prototypes were developed to respond to current health conditions. Heliotherapy, a way of treating illness by exposing a patient to regulated solar

radiation became popular to treat nervous disorders and tuberculosis caused by rapid industrialization and poor hygienic conditions.[74]

In 1903 French architect M. Eugene Pettit, in consultation with physician Lucien Pellegrin, exhibited a rotating "heliotropic house" at the Exposition de l'Habitation in Paris. A cross-shaped plan with large window openings on most walls enabled light to penetrate into the interior. The entire house was set on a turntable with a ground-level ball-bearing raceway.[75] Solar medical treatment was further facilitated by doctor Jean Saidman and architect Andre Fardeto treat patients with various forms of rheumatism, dermatosis, tuberculosis, rickets and cancer. The pivoting structure had a conical base, which contained a gigantic motor that spun a wing-like structure attached towards the top of the cone for better solar exposure. Jean Saidman patented the structure in 1929, and within five years, two other solarium hospitals – in Vallauris, France and Gujarat, India – were constructed.[76]

More residential scaled sanatoria in the form of rotating shelters were built in Britain and Europe. Examples include Kelling Sanatorium for Working Men in Norwich, England, which had at least a dozen rotating, wood-framed shelters. Other UK hospitals that used rotating treatment shelters included the City Hospital for Infectious Disease and the Astley Ainslie Hospital, both in

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[74] Margaret Campbell, "What Tuberculosis did for Modernism: The Influence of a Curative Environment on Modernist Design and Architecture," *Medical History* 49 (2005): 469, 478.
[75] "A House that Turns with the Sun," *Scientific American* 89, no. 19 (1903): 330.
[76] Randl, *Revolving Architecture: A History of Buildings that Rotate, Swivel, and Pivot*, 58.

Edinburgh, Scotland. While most of these treatment spaces were custom designed, some went into manufacturing rotating shelters for institution and individual use. Boulton & Paul, an English manufacturer and W Richardson & Company distributed a catalogue of rotating summer houses ca. 1910.[77]

Villa Girasole by Angelo Ivernizzi (1935) in Verona, Italy achieved Pivot in a distinct way. The building was divided into two parts: the fixed base and the mobile living quarter which rotated on top of the fixed structure. “The base contained the entrance shaft, as well as the garage. The chevron shaped top portion of the villa is in direct contrast to the base, as if it were an addition. Mounted on a platform of meter high wheels, it is organized around, and structurally interconnected with a spinning central cylindrical core. (See Figures 2.2.29 and 2.2.30) A concrete spiral stair in this core extends 42.35 meters from a trust block at the base to an illuminated cupola at the top.”[78] Unlike modern forms of a rotating house, the top is not a round disk, but rather two rectangular wings connected at the edge forming 90 degrees, occupying less than quarter of the cylindrical base. The rotating portion is powered by only two motors or three horse power that moves the structure at 4mm a second. A full rotation is possible in nine hours and twenty minutes.

The two-story rotating top holds the primary living space. The first level contains the formal garden and public areas and the top floor is private spaces,

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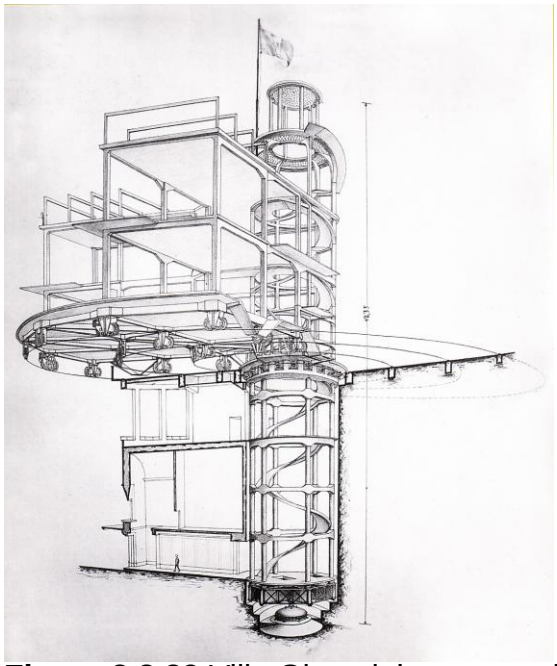
[77] Margaret Campbell, “What Tuberculosis did for Modernism: The Influence of a Curative Environment on Modernist Design and Architecture,” *Medical History* 49 (2005): 481.
[78] David J. Lewis et al., “Mechanical panoramas: Invernizzi's Il Girasole,” *AA Files* 55 (2007): 31.

abiding be the conventions of the villa. Over time, the vertical shaft's grinding movement, penetrating into the earth-bound architecture, has begun to wear away the building.[79]



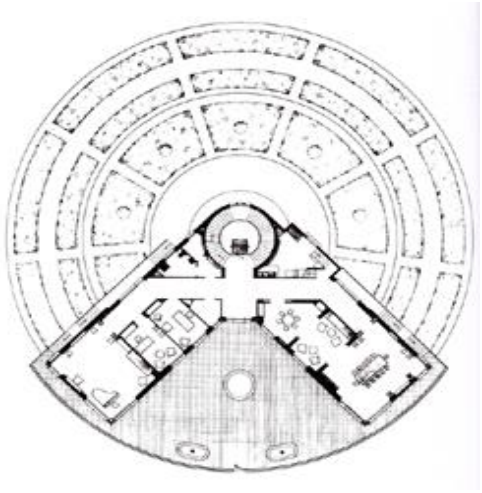


Figure 3.2.29 Villa Girasole's structural frame.
PhotoCrd: Chad Randl, Revolving Architecture (New York; Princeton Architectural Press,2008), 77.

Figure 3.2.30 Villa Girasole's first floorplan. The quarter circle shaped building rotates along the circular track.
PhotoCrd: Chad Randl, Revolving Architecture (New York; Princeton Architectural Press,2008), 77.

The rotational motion in residential environments came a few years later despite the availability of the technology. Architect Richard Foster's solution to taking full advantage of the spectacular view on the lakeside was building a house that rotates (1968). The seventy two feet diameter house is enclosed in glass on a pedestal, rotating constantly. Foster adapted a fourteen feet ball-

[79] David J. Lewis et al., "Mechanical panoramas: Invernizzi's Il Girasole," *AA Files* 55 (2007): 35.

bearing assembly that moves the structure around the pivot of the stairwell.[80] The motion of the house can be controlled by three switches that say "forward," "backward," and "stop." At top speed, the house can make a complete turn in 48 minutes; at the slowest rate it takes four hours. The architect's solution successfully achieves complex organization for living while preserving the unity and symmetry of a self-contained formal shape. The running cost is approximately that of a refrigerator, and the bearing will last the life of the house.[81] (See Figure 2.2.31)

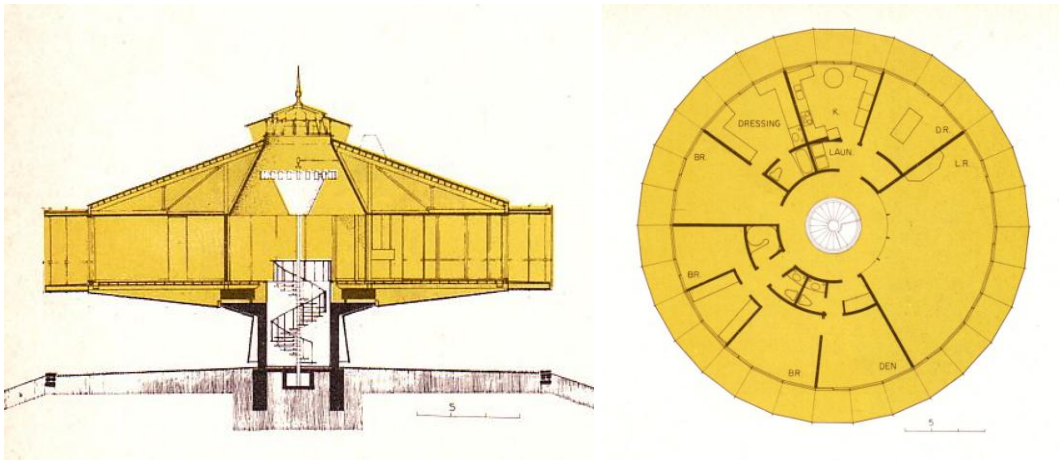


Figure 3.2.31 Sectional view of rotating home of Architect Richard Foster. The structure revolves about the central staircase.
Figure 2.2.26 Plan view of rotating home of Architect Richard Foster.
PhotoCrd: Architectural Record, Apr. 1969, 178, 180.

In 2004 Al Johnstone, a self-taught engineer and builder built the first rotating house that meets building codes in La Mesa, California.[82] Like its precedent,

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[80] "Architect's Revolutionary Idea: Living in a House That Rotates," *New York Times*, September 3, 1968, 38.
[81] "Beautiful detailing enhances a very special house," *Architectural Record* 145 (1969):177.
[82] Rotating Home, "Maximize Your View," Rotating Home, http://www.rotatinghome.com/index.html (Accessed Feb. 27, 2009)

the house takes form of a cylindrical dish, like the one built by Richard Foster. The 5,100 sq ft. four-bedroom house on Mount Helix takes full advantage of the view. Al Johnstone installed a swivel with sections for communication, electricity, plumbing and gas that will remain at the core because wires and pipes cannot withstand twisting and turning. (See Figure 2.2.30) The house can make a rotation in half an hour, and takes one and a half horse power motor, which is equivalent to the cost running a typical swimming pool. Solar panels installed on the roof collects 80 percent of home's energy.[83]

Figure 3.2.32 Illustration showing interior of Al and Janet Johnstone's rotating home.
PhotoCrd: Gastite Brochure, "Case Study #110: The Rotating Home," Titeflex Corporation, Jan. 2004
http://www.gastite.com/include/languages/english/downloads/pdfs/CSS-110Rotating.pdf (Accessed Apr. 23, 2010)

[83] Anne Krueger, "A Home in a Spin," The San Diego Union Tribune, http://www.signonsandiego.com/uniontrib/20060210/news_7m10rotate.html.

The first rotating skyscrapers are scheduled to be completed in 2010. Designed by Infinity Architects headed by Dr. David Fisher, the Dynamic Tower is an 80 floors and 1,380 feet tall apartment building in progress in Dubai, and 70 floors and 1,312 feet tall building in Moscow.[84] Adding a fourth dimension, “time” to architecture, the Dynamic Tower offers infinite design possibilities, as each floor rotates independently to create a building that constantly changes its shape. The rotation of the building adjusts to the sun and the wind, to the view and to the occupant’s requirement. Dr. Fisher states that each floor can rotate individually, ever changing the shape of the building. (See Figures 3.2.31, 3.2.32, and 3.2.33)

Walls and partitions divide spaces within the floor plan. Furniture arrangements are oriented outward and the exterior becomes the background for activities. Stretched in the centripetal direction and concentric to the inner core, rooms often take a shape of a pie. Full height glass wall surrounds the exterior, creating a floating experience as if one is on a rotating space ship. The Dynamic Tower promises luxurious living experience accompanied by ever changing view as a spectacular milieu.

[84] Tim McKeough, “A prefab, rotating skyscraper coming to a city near you?,” Architectural Record v.196, n.8 (2008): 38.

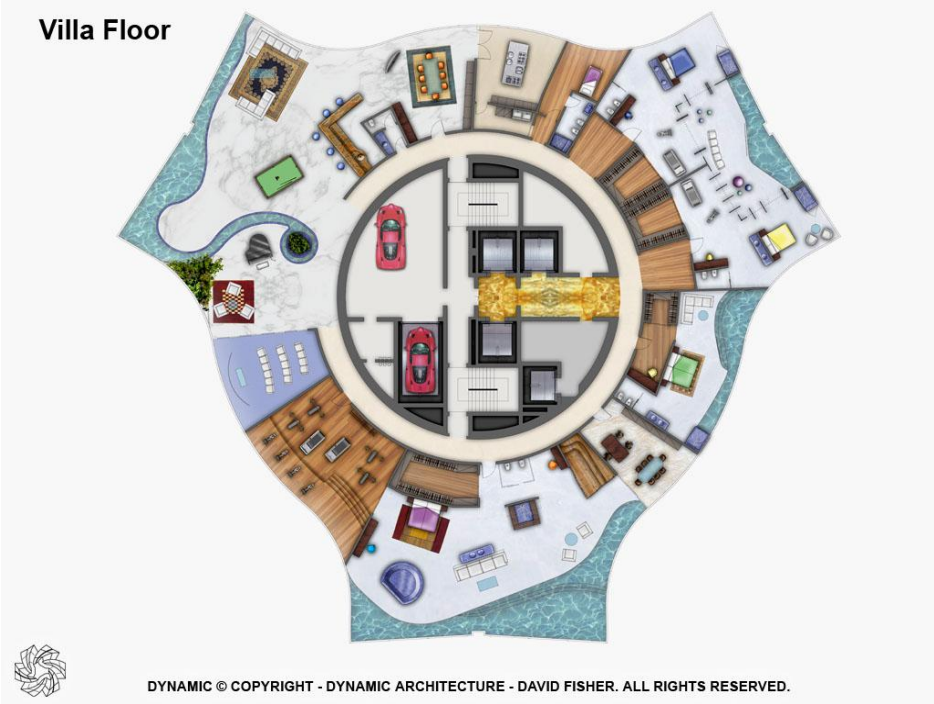

Figure 3.2.33 Computer rendering of the Dynamic Future Hotel concept by Dr. Fisher.
Figure 3.2.34 Computer rendering of an interior of Dynamic Future Hotel showing a view to exterior.
Figure 3.2.35 Floor plan of a rotating floor. The central core remains static. PhotoCrd: Dynamic Architecture, http://www.dynamicarchitecture.net/index.php?option=com_content&view=article&id=156&Itemid=68&lang=eng (Accessed Apr. 23, 2010)

Pivot is not an invention of modern times; it stemmed from an ancient idea of rotational mechanisms. When utilized to maximize the interior spatial asset within a built environment, Pivot provides flexibility and variety to the space. In the spirit of Industrial Revolution, rapid technological innovations such as electricity, steam locomotives, and the automobile, public interest in mechanized living was at its peak during the early 1900s. This trend was reflected on the minds of avant-garde inventors, such as Earl Tate, Pasquale Cimini as well as designers, architects, and former president Thomas Jefferson. Upon the postwar economic boom, various types of Pivot emerged and evolved through ebb and flow. The most consistent form of Pivot is the vertical plane, steadily utilized by designers and architects to form a breakable elevation that provides partition as well as threshold. Minimalist aesthetic was realized by obtaining an open space consisting of planes devoid of markings of egress. The second type, pivoting vertical casework didn't win public acclaim due to technical difficulty as well as practicality.[85] One simple reason for the cessation of pivoting casework was that the apparatuses were designed for a single user rather than multiple users with different agenda of activities. Another problem with pivoting casework was that turning was limited to non-electric items due to the inability of electricity, water, and gas pipes in motion. These problems were later solved by architects and engineers in realization of more complex revolving structures.

Pivoting horizontal plane is a classic form of turntable. This third type of Pivot established the relationship between the subjects of rotation versus those on

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[85] Randl, *Revolving Architecture: A History of Buildings that Rotate, Swivel, and Pivot*, 74.

the periphery or the static part of the space. Thus pivoting horizontal planes were in demand in spaces dedicated to showcasing performance and exhibitions for spectators. Examples of stage design during the early 1900s show integrated turntables; more recent examples include dance halls, residential spaces and lecture halls. The revolving restaurant boom during 70s, 80s, and 90s caused a sharp increase of horizontal pivoting planes. The natural view substituted the interior decorations. Pivoting rooms and buildings started as a medical effort to treat various diseases through exposure to sun in rotating sun rooms. The idea developed into rotating residences throughout the 20th century.

Some critics view Pivot as an idiosyncratic invention or challenge to the established architectural vocabulary, however this chronological sequence beginning in the1930s to present shows how multiple types of Pivot and their evolution have changed the perception of interior architecture.[86]

[86] Evidence for the use and the chronological sequence of Pivot as a Transformative Interior archetype was developed from the following sources: **1930** Villa Girasole [1935] Angelo Ivernizzi; Verona, Italy in David J. Lewis et al., "Mechanical panoramas: Invernizzi's Il Girasole," *AA Files* 55 (2007): 31; Rainbow Room at the Rockefeller Center [Built in 1934; Renovated1988] Hardy Holzman Pfeiffer; New York, NY in Edie Lee Cohen, "Rainbow," *Interior Design* 59, no. 9 (Jun. 1988): 242; PhotoCrd: Cervin Ronbinson; **1940** Anonymous Residence [1945] Michael Goodman in John Normille, "House Omnibus: Better Homes and Gardens," *Architectural Forum 82*, no. 4 (Apr. 1945): 97; PhotoCrd: Anonymous; **1960** The Eye of the Needle, Space Needle [1962] John Graham; Seattle, WA in Chad Randl, *Revolving Architecture* (New York; Princeton Architectural Press, 2008) 109; PhotoCrd: University of Washington Libraries, Special Collections, UW 14798; Roto-Living [1965] Joe Colombo; Italy in Ignazia Favata, *Joe Colombo : and Italian design of the sixties* (Cambridge, Mass. : MIT Press, 1988) 16. Richard Foster Residence [1968] Richard Foster; Connecticut in Anonymous, "Beautiful detailing enhances a very special house," *Architectural Record* 145 (1969):177; PhotoCrd: Ezra Stoller; **1970** Sleeping Wall Advertisement [1972]

ICF; *Interior Design* 43 no. 4 (Apr. 1972): 99; PhotoCrd: ICF; Communication Capsule Advertisement [1973] Drexels Communication; *Interior Design* 44 no. 5 (May 1973): 109; PhotoCrd: Drexel Communication; Canadian National Tower [1976] Francesco and Aldo Piccaluga in "Toronto CN Tower: Un Grande Ristorante Girevole," *Domus* 586 (1978): 39; **1980** Revolving restaurant, Hyatt Regency Hotel [1985] Banks Eakin Architects; New Orleans in Garret Eakin, "Revolving Restaurant Hyatt Regency Hotel, New Orleans," *Chicago Architectural Journal* 5 (1985): 97; PhotoCrd: Banks Eakin Architects; The View at Marriott Hotel in New York [1986] John Portman Associates; New York, NY in Maureen Picard, "Solutions: Reflecting on Design," *Restaurant and Hotel Design* 8 no. 7 (Sep. 1986): 40; PhotoCrd: John Ortner; Haigh Space [1987] Haigh Space; New York, NY in Edie Lee Cohen, "Haigh Space, New York," *Interior Design* 58 no. 7 (May 1987): 304; PhotoCrd: Elliot Kaufman; Rainbow Room at the Rockefeller Center [Built in 1934; Renovated1988] Hardy Holzman Pfeiffer; New York, NY in Edie Lee Cohen, "Rainbow," *Interior Design* 59, no. 9 (Jun. 1988): 242; PhotoCrd: Cervin Ronbinson; Architectural Wall Systems, the Merchandise Mart [1988] Eva Maddox Associates; Chicago, IL in Paula Rice Jackson, "Showroom winner: Eva Maddox Associates: Architectural Wall Systems, The Merchandise Mart, Chicago," *Interiors* 147 no. 6 (Jan. 1988): 152; PhotoCrd: Nick Merrick, Hedrich-Blessing**;** Rainbow Room at the Rockefeller Center [1988] Hardy Holzman Pfeiffer; New York, NY in Edie Lee Cohen, "Rainbow," *Interior Design* 59, no. 9 (Jun. 1988): 242; PhotoCrd: Cervin Ronbinson; **1990** Osgood & Associates [1990] Osgood & Associates; Atlanta, GA in Monica Geran, "Osgood & Associates," *Interior Design* 61, no. 7 (Jul. 1990): 145, plate 1,2; PhotoCrd: Rion Rizzo; Storefront for Art and Architecture [1994] Steven Holl and Vito Acconci; New York, NY in Peter Slatin, "Holl and Acconci Reface Storefront," *Architecture* 83 no. 1 (Jan. 1994): 23; PhotoCrd: Staff/Anonymous; Antares Restaurant [1993] Deborah Lloyd Forrest; Dallas, TX, in Meyer Rus, "Deborah Lloyd Forrest," *Interior Design* 65/64, no. 6 (Jun. 1993): 138, plate 1,2; PhotoCrd: Mary E. Nichols; Mahattan Loft [1995] Scott Marble Karen Fairbanks Architects; New York, NY in "Scott MarbleKaren Fairbanks," Interior Design 66 no 5 (May 1995):165; PhotoCrd: Peter Paige; James McDonnell Hall, Princeton University [1998] Gwathmey Siegal and Associates; Princeton, New Jersey in Kira L. Gould, "James S. McDonnell Hall, Princeton University," *Architectural Record* 186, no. 10 (Oct., 1998): 151, plate 1; PotoCrd: Norman McGrath; Goolrick's Architecture Studio and Residence [1999] Page Goolrick Architects; New York, NY in Edie Cohen, "Bon Voyage," *Interior Design* 70, no. 11 (Sep. 1999): 237; PhotoCrd: John M. Hall; **2000** Salon Blauraum [2002] Blauraum Architekten; Hamburg, Germany in Arian Mostaedi *Great Space: Flexible Homes* (Barcelona, Spain; 2006), 74; PhotoCrd: Blauraum Architekten; TMP Worldwide / Monster [2002] Mufson Partnership; New York, NY in Anne Guiney, "Dot-Calm," *Interior Design* 73, no. 12 (Dec. 2002): 100, plate 1; PhotoCrd: Durston Saylor; Miss Sixty Store [2003] Borruso &

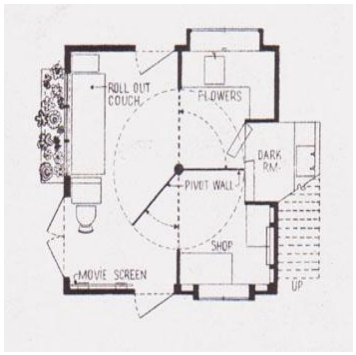
Alessandro Design; South Coast Plaza, Costa Mesa, CA in Edie Cohen, "Sassy Miss Sixty," *Interior Design* 74, no. 4 (Apr. 2003): 80; PhotoCrd: Benny Chan Fotoworks; Wright Residence [2004] David Vandervort Architects; Seattle in Amara Holstein, "From Shack to Shangria-La," *Dwell* (Dec. 2004): 80; PhotoCrd: Michael Moore; Johnson Residence [2004] Al Johnstone; La Mesa, CA in Chad Randl, *Revolving Architecture* (New York; Princeton Architectural Press, 2008) 109; PhotoCrd: University of Washington Libraries, Special Collections, UW 14798; Rotor Haus [2004] Luigi Colani and Hanse Haus; Germany in Chad Randl, *Revolving Architecture* (New York; Princeton Architectural Press, 2008) 109; PhotoCrd: Hanse Haus; Nissan Design America [2005] Luce et Studio; La Jolla, CA in Edie Cohen, "Changing Lanes," *Interior Design* 76, no. 9 (Jul. 2005): 228-229, 230, plate 2; PhotoCrd: Art Gray; Conference Room, Royal Bank of Scotland [2005] DMJM Rottet; Houston, Texas in Edie Cohen, "Financial Statement/Fashion Statement," *Interior Design* 76 no. 12 (Oct. 2005):287; PhotoCrd: Benny Chan/ Fotoworks; Villa les Roses [2006] Fabienne Couvert and Guillaume Terver in Arian Mostaedi, *Great Spaces: Flexible Homes*, (Barcelona, Spain: Carles Broto I Comerma, 2006): 57; PhotoCrd: Fabienne Couvert and Guillaume Terver; The Blatz [2008] Johnsen Schmaling Architects; Milwaukee, Wisconsin in Amy Milshtein, "Interior Awards; Public Space", *Contract* 50 no. 1 (Jan. 2008): 108; plate 1; PhotoCrd: Kevin Miyazaki; Suite Vollard [2009] Bruno De Franco Arquitetura com Alma; Curitiba, Brazil in *Atlas of Architecture: Urbarama*, "Suite Vollard," http://pt.urbarama.com/project/suite-vollard (Accessed Jun. 22, 2010)**;** Museum of Tolerance [2009] Yazdani Studio of Cannon Design; Los Angeles, CA in Craig Kellogg, "Harmony and Understanding," *Interior Design* 80 no. 7 (May 2009): 142; PhotoCrd: Benny Chan / Fotoworks; Rotating Skyscraper [2010] David Fisher Architects; Dubai, India in Tim McKeough, "A Prefab, Rotating Skyscraper Coming to a City Near You?," *Architectural Record* 196, n.8 (2008): 38; Evidence for the use and the chronological sequence of Pivot as a Transformative Interior archetype was also developed from site visits conducted by the researcher, Elizabeth Erin Lee, in the 2007-2010 period: New York City- Storefront for Art and Architecture, The View at Marriott Hotel.

1930s 1940s 1960s

Title | **Il Girasole**
Credit | Oberto Gili

Il Girasole [1935] Verona, Italy
Design | Ettore Fagiuoli

Copyright Citation |
Il Girasole [1935] Ettore Fagiuoli; Verona, Italy in Tod Williams, "The House that Turns to the Sun," *House and Garden* 159, no. 2 (Feb. 1987): 154; PhotoCrd: Oberto Gili



Title | **Anonymous Residence**
Credit | NA

Anonymous Residence [1945]
Design | Michael Goodman

Copyright Citation |
Anonymous Residence [1945] Michael Goodman in John Normile, “House Omnibus,” *Architectural Forum*, (Apr. 1945): 97; PhotoCrd: NA

Title | **Roto-Living**
Credit | Joe Colombo Studio

Roto-Living [1965] Milan, Italy
Design | Joe Colombo

Copyright Citation |
Roto-Living [1965]Joe Colombo; Milan, Italy in Ignazia Favata, Joe Colombo : and Italian design of the sixties (Cambridge, Mass. : MIT Press, 1988), 16, plate 1, plate 5; PhotoCrd: Joe Colombo Studio

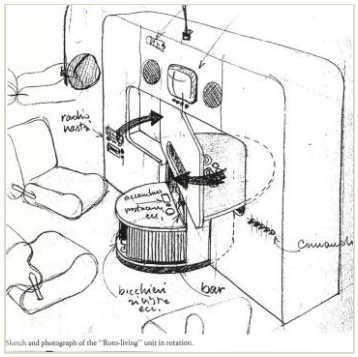
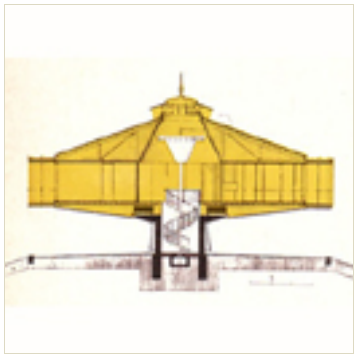


Figure 3.2.36 Pivot: Photographic Timeline

Figure 3.2.36 (continued)

1960s



Title | **Richard Foster Residence**
Credit | Ezra Stoller

Richard Foster Residence [1968]
Connecticut
Design | Richard Foster

Copyright Citation |
Richard Foster Residence [1968]
Richard Foster; Connecticut in Anonymous, “Beautiful detailing enhances a very special house,” *Architectural Record* 145 (Apr. 1969):180, plate 3, 178, plate 2; PhotoCrd: Ezra Stoller

1970s

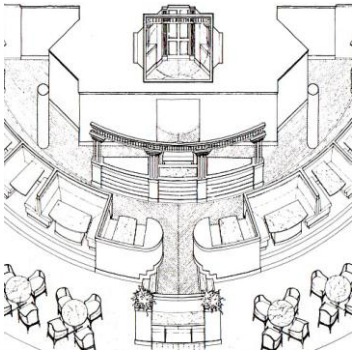
Title | **Interlubke Advertisement**
Credit | NA

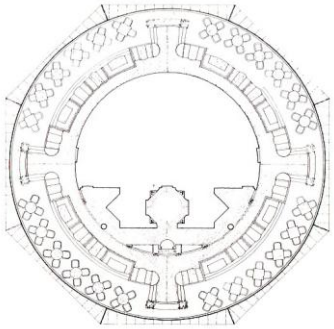
Sleeping Wall Advertisement [1972]
Design | Interlubke

Copyright Citation |
Sleeping Wall Advertisement [1972]
Interlubke; *Interior Design* 43 no. 4 (Apr. 1972): 99; PhotoCrd: NA

Figure 3.2.36 (continued)

1980S





Title | **Revolving restaurant, Hyatt Regency Hotel**
Credit | Banks Eakin Architects

Revolving restaurant, Hyatt Regency Hotel [1985] New Orleans
Design | Banks Eakin Architects

Copyright Citation |
Revolving restaurant, Hyatt Regency Hotel [1985] Banks Eakin Architects; New Orleans in Garret Eakin, "Revolving Restaurant Hyatt Regency Hotel, New Orleans," *Chicago Architectural Journal* 5 (1985): 97; PhotoCrd: Banks Eakin Architects

1980S

Title | **The View at Marriott Hotel**
Credit | John Portman Associates

The View at Marriott Hotel in New York [1986] New York, NY
Design | John Portman Associates

Copyright Citation |
The View at Marriott Hotel in New York [1986] John Portman Associates; New York, NY in Maureen Picard, "Solutions: Reflecting on Design," *Restaurant and Hotel Design* 8 no. 7 (Sep. 1986): 40; PhotoCrd: John Ortner

Figure 3.2.36 (continued)

1980s

Title | **Office for Haigh**
Credit | Elliot Kaufman

Office for Haigh [1987] New York, NY
Design | Haigh

Copyright Citation |
Office for Haigh [1987] Haigh; New York, NY in Edie Cohen, “Haigh Space,” *Interior Design* 58, no. 5 (May 1987): 305, plate 1,2,3; PhotoCrd: Elliot Kaufman

1990s

Title | **Osgood & Associates**
Credit | Rion Rizzo

Osgood & Associates [1990] Atlanta, GA
Design | Osgood & Assoc.

Copyright Citation |
Osgood & Associates [1990] Osgood & Assoc.; Atlanta, GA in Monica Geran, “Osgood & Associates,” *Interior Design* 61, no. 7 (Jul. 1990): 145, plate 1,2; PhotoCrd: Rion Rizzo

Figure 3.2.36 (continued)

Title | **Antares Restaurant**
Credit | Mary E. Nichols

Antares Restaurant [1993] Dallas, TX
Design | Deborah Lloyd Forrest

Copyright Citation |
Antares Restaurant [1993] Deborah Lloyd Forrest; Dallas, TX, in Meyer Rus, “Deborah Lloyd Forrest,” *Interior Design* 65/64, no. 6 (Jun. 1993): 138, plate 1,2; PhotoCrd: Mary E. Nichols

Figure 3.2.36 (continued)

1990S

Title | **Storefront for Art and Architecture**
Credit | Paul Warchol

Storefront for Art and Architecture [1993] New York, NY
Design | Steven Holl and Vito Acconci

Copyright Citation |
Storefront for Art and Architecture [1993] Steven Holl and Vito Acconci; New York, NY in Mayer Rus, “Design Revolution: 100 years that Changed Our World,” *Interior Design* 70, no. 15 (Dec. 1999): 189, plate 1,2; PhotoCrd: Paul Warchol

1990S

Title | **Mahattan Loft**
Credit | Peter Paige

Mahattan Loft [1995] Scott Marble New York, NY
Design | Karen Fairbanks Architects

Copyright Citation |
Mahattan Loft [1995] Scott Marble Karen Fairbanks Architects; New York, NY in "Scott MarbleKaren Fairbanks," *Interior Design* 66 no 5 (May 1995):165; PhotoCrd: Peter Paige

Figure 3.2.36 (continued)

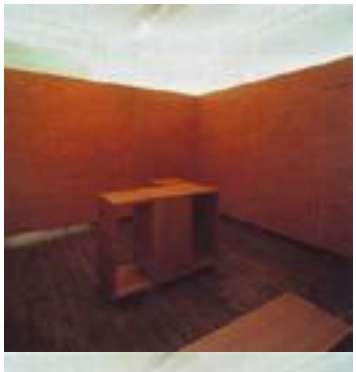
2000s

Title | **Johnstone House**
Credit | Al and Janet Johnstone

Johnstone House [2001-2] La Mesa, CA
Design | Al Johnstone

Copyright Citation |
Johnstone House [2001-2] Al Johnstone; La Mesa, CA in Chad Randl, Revolving Architecture; *A History of Buildings that Rotate, Swivel, and Pivot* (New York: Princeton Architectural Press, 2008), 177, plate 2; PhotoCrd: Al and Janet Johnstone

2000s



Title | **Salon Blauraum**
Credit | NA

Salon Blauraum [2002] BHamburg, Germany
Design | Blauraum Architekten

Copyright Citation |
Salon Blauraum [2002] Blauraum Architekten; Hamburg, Germany in Anonymous, “Multifunktional,” *AIT:Architektur Innenarchitektur Technischer Ausbau* (Oct. 2002): 178; PhotoCrd: NA

Figure 3.2.36 (continued)

2000s

Title | **TMP Worldwide Office**
Credit | Durston Saylor

TMP Worldwide Office [2002] New York, NY
Design | Mufson Partnership

Copyright Citation |
TMP Worldwide Office [2002] Mufson Partnership; New York, NY in Anne Guiney, "Dot-Calm," *Interior Design* 73, no. 12 (Dec. 2002): 100, plate 1; PhotoCrd: Durston Saylor

2000s

Title | **Rotor Haus Prototype**
Credit | www.hanse-haus.com

Rotor Haus Prototype [2004] Germany
Design | Luigi Colani

Copyright Citation |
Rotor Haus Prototype [2004] Luigi Colani; Germany in Chad Randl, “Rotor Haus, ” Revolving Architecture: A History of Buildings that Rotate, Swivel, and Pivot” (New York: Princeton Architectural Press, 2008), 150, 151 plate 1, 152; PhotoCrd: www.hanse-haus.com

Figure 3.2.36 (continued)

2000s

Title | **Conference Room, Royal Bank of Scotland**
Credit | Benny Chan/ Fotoworks

Conference Room, Royal Bank of Scotland [2005] Houston, Texas
Design | DMJM Rottet

Copyright Citation |
Conference Room, Royal Bank of Scotland [2005] DMJM Rottet; Houston, Texas in Edie Cohen, "Financial Statement/Fashion Statement," *Interior Design* 76 no. 12 (Oct. 2005):287; PhotoCrd: Benny Chan/ Fotoworks

2000s

Title | **Museum of Tolerance**
Credit | Benny Chan / Fotoworks

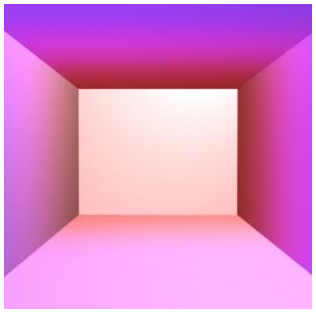
Museum of Tolerance [2009] Los Angeles, CA
Design | Yazdani Studio of Cannon Design

Copyright Citation |
Museum of Tolerance [2009] Yazdani Studio of Cannon Design; Los Angeles, CA in Craig Kellogg, "Harmony and Understanding," Interior Design 80 no. 7 (May 2009): 142, plate 2; PhotoCrd: Benny Chan / Fotoworks

3.3 Chameleon

InType

Chameleon



Definition

Chameleon describes the transformation of an interior by manipulating and varying solid areas of colored light over time on a single plane or throughout the entire spatial envelope. The event emerges when multiple colors cycle at regular intervals on programmable control or by manual means.

Similar but Different

Chameleon has a relationship with the InType Color Flood.[1] Both use colored light to fill the interior space; however, Color Flood features only one hue to homogenize a space. Its effect does not change over time. In contrast, Chameleon employs multiple hues of non-static saturated light. In addition,

[1] Joanne Kwan. *Theory Studies: Archetypical Artificial Lighting Practices in Contemporary Interior Design* (MA Thesis, Cornell University, 2009), 89.

Color Flood encompasses the entire space, whereas Chameleon may emerge on only one plane, several surfaces or it may envelop the whole room.

Description

Chameleon uses light as the primary instrument to transform a space into an active color-filled interior through the manipulation of luminance and chromaticity. To maximize the dramatic effect, interiors with Chameleon have several distinct features. The surrounding environment, walls, floors, and ceiling, are treated with neutral color or white and serve as a blank canvas primed for the colorization. To echo the effect to the fullest, translucent or highly polished materials are often used on surrounding finishes and furniture pieces.

Effect

The effect of Chameleon is achieved through the change of lighting conditions, such as saturation, hue, and the time cycle. The number of operations achieve specific design goals that give the space a unique character. Chameleon conveys the passage of time through cyclical color change to deliver a sense of delayed time, or rapid movement depending on the level of stimulation desired. Primarily, Chameleon creates a more interactive and visually provocative environment. The heightened sensory experience alleviates spatial limitations such as low ceiling height, long narrow corridors, or windowless spaces. Sometimes Chameleon occurs in conjunction with sculpturally streamlined or visually organic interior, which accentuates the surreal sensation as well as fluid movement. (See Figure 2.3.1) When preserving the original state of an historical building, Chameleon renders

classical architectural details in a new and provocative perspective without committing to any permanent physical alterations.

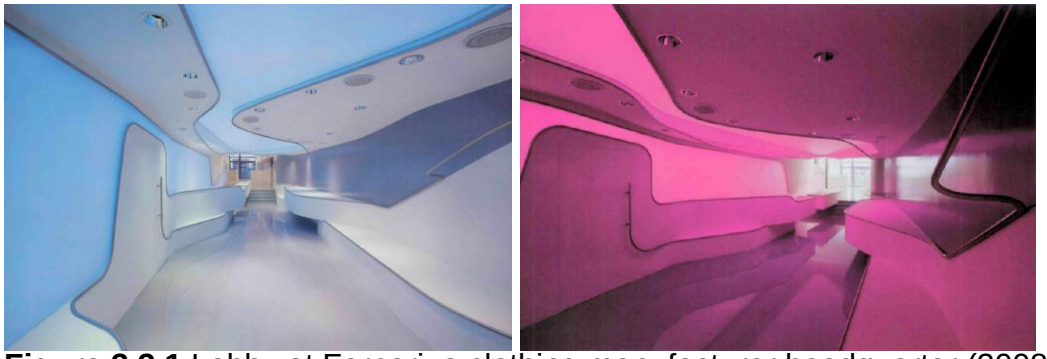


Figure 3.3.1 Lobby at Fornari, a clothing manufacturer headquarter (2008) designed by Giorgio Burruso in Milan, Italy. Biomorphic shapes with Chameleon gives a sense of fluid movement along the passage way. PhotoCrd: Interior Design Dec. 2008, 110.

Chameleon is also used to communicate alternate purposes for the same space. For example, a promotional space for a London-based broadcast company (2003) employed Chameleon to signify a change in activity from corporate communal dining to a festive club-like space. (See Figure 2.3.2) During the day, the space is an employee cafeteria with windows for natural daylight. For social functions, blinds cover windows and the four canopies each receive a different color of artificial lighting. The result is a multicolored space that gradually progresses from one color to another. This is an example of a sustainable strategy; Chameleon affords multifunctional capabilities for minimal expense and physical disruption.

Because of its numerous advantages, Chameleon occurs in all types of interior practices. Restaurants, bars and retail spaces favor changing light to provide a lively atmosphere, where spontaneous social interaction is encouraged to

attract customers. Chameleon also finds popularity in airport terminals and pedestrian walkways as a method to entertain inhabitants as they journey from one location to another, often at long distances. Professor and Architect Meerwin refers to this effect as “the kinesthetic sense, which is enhanced by color dynamics and contrasts in spaces and spatial contexts that promote movement and social dynamics.”[2] Chameleon aims to influence behavior through environmental change, thereby adding spatial drama to the interior. This draws people into the space and entices prolonged visitors’ stay.

Figure 3.3.2 Using light permeable canopies, one light scheme is for ‘night party’ mode and the other for cafeteria during the day.
PhotoCrd: Mark Major, Jonathan Speirs, and Anthony Tischhauser, Made of Light: The Art of Light and Architecture (Basel, Switzerland: Birkhauser, 2005) 159.

Origins of Chameleon

Transformative colored light can be traced to 12th century Europe and the stained glass windows in the great Gothic churches and cathedrals.[3] In

[2] Meerwin and B. Rodeck, *Color-Communication in Architectural Space* (Boston: Birkhauser, 1998), 24.
[3] Virginia Chieffo Raguin, *Stained Glass: from its Origins to the Present* (New York: H. N. Abrams, 2003), 37.

Western culture, stained glass was used to educate people about narratives from the bible. As natural light penetrated the colored glass pictures glowed and heightened people's awareness during the religious ceremony. Colored patterns of light were projected onto floor, wall surfaces and onto people's faces inside the church according to the angle and intensity of the sun. Along with the high ceiling of gothic cathedrals, stained glass elicited a spiritual moment and a divine experience. The use of stained glass continued well into the 20th century as an effective design element in contemporary buildings. During Arts and Crafts movement which began in the1880s, stained glass windows remained a strong decorative element as evidenced in the Gamble House (1908) by Greene and Greene. Animated light patterns from stained glass are also cited in celebrated interiors of the Chapel of Notre Dame du Haut in Ronchamp (1955) by Le Corbusier and the Sagrada Familia (1882-present) by Antonio Gaudi. (See Figure 2.3.3) Compared to Gothic cathedrals, modern religious buildings use stained glass with less formal constraints. For instance, Johannesbund Convent in Leutesdorf, Germany (1966) by Johannes Schreiter achieves colored volume within the altar space surrounded by stained glass walls. Through sunlight renders bluish glow to create a deeply spiritual space. (See Figure 2.3.4) Beyond the conscious creation of natural light passing through tinted glass there is little historical evidence for the deliberate use of colored light within buildings until the advent of electric light enabled man to manipulate it through artificial means.[4]

[4] Mark Major et al., *Made of Light: The Art of Light and Architecture* (Basel, Switzerland: Birkhauser, 2005), 111.

Figire 3.3.3 Interior of Sagrada Familia by Antonio Gaudi. Sunlight shone through stained glass scatters colorful light spots. (1882~present) PhotoCrd: http://commons.wikimedia.org/wiki/File:Sagrada_Familia_interior_2.jpg (Accessed 5/3/10)

Figure 3.3.4 Johannesbund Convent in Leutesdorf, Germany (1966) by Johannes Schreiter. Stained glass surrounding the alter brings an strong blue hue into the space. The brightness and intensity changes as the day goes. PhotoCrd: Viriginia Chieffo Raguin, Stained Glass: From its Origins to the Present, (London, UK: Quintet Publishing Limited, 2003): 262

Another root of Chameleon can be explored through the history of the theater. Early stage lighting was solely dependent on sunlight and background color. In the 16th century, Italian architect Sebastiano Serlio first achieved colored light using colored water. Candles, gas light and finally electric bulbs in the 1880s enhanced control over light's color, intensity, and pace of change on the theatrical stage. Theaters in early 1900s utilized an electrical lighting system and the multi-channel dimmable lighting control device.[5] Lighting technology from the theater made its transition to entertainment venues, where mixed hues created changes in mood.[6]

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[5] Robert S. Simpson, *Lighting Control – Technology and Applications* (Oxford, UK: Robert S. Simpson, 2003), 280.

[6] Mark Major et al., *Made of Light: The Art of Light and Architecture,* 111.

The technological advancement in theater lighting was influential in the lighting design of discotheques and nightclubs, where novel multimedia experiences were a high priority.[7] Experimental projects like the Cerebrum nightclub (1968) presented interior spaces aimed to stimulate senses by employing variation of colored lights. Designed by John Stroyk, the space was envisioned "to disorient, obliterate the body-to-ground relationship, and open a door to sensation." It was part of the trend in nightclub scenes, to induce "dreamlike sensations without LSD."[8] The creation of deliberately disorienting interiors was a product of pop culture and the psychedelic movement.[9] Disco balls and strobe lights used in modern nightclubs strove to induce similar sensations. The 1960 era of discotheques and nightclubs triggered designers to be more bold and strategic about manipulating interior lighting qualities which further led to the development of Chameleon.

Throughout the 1960s and 1970s, American home owners and retailers employed Chameleon during the Christmas holiday. First designed in 1958, aluminum Christmas trees accompanied by an electric rotating color wheel became an icon of modernity. Alternating colored light projected onto the tree branches animated the whole interior with varying hues and colorful shadow patterns.

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[7] Joanne Kwan, *Theory Studies: Archetypical Practices of Interior Lighting*, 94.
[8] Alastair Gordon, "What a Long, Strange Trip It's Been," *Interior Design* 78 no. 3 (Mar, 2007): 354.
[9] Anne Massey, *Interior Design of the 20th Century* (London: Thames and Hudson Ltd., 1990),185.

Light Art in 1960s introduced new ways of assigning colors to a space. The idea of a color-drenched space was first introduced when American conceptual artist Dan Flavin used colored fluorescent light tubes to make light sculptures from three key elements: light, color and space.[10]

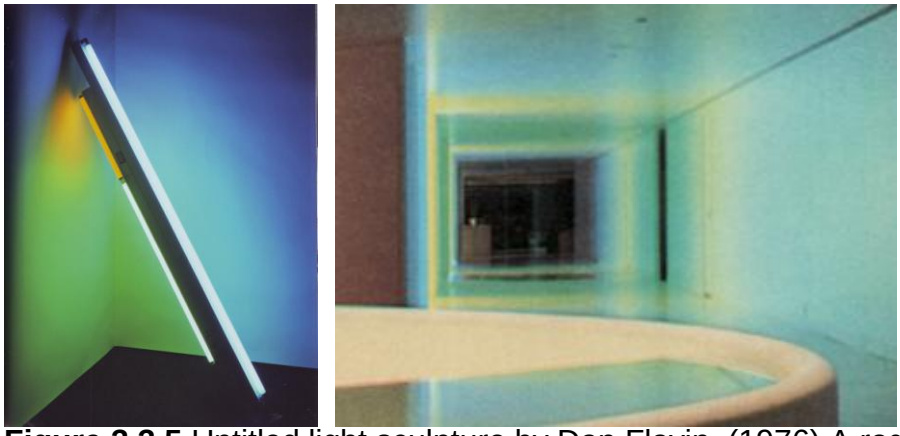

Figure 3.3.5 Untitled light sculpture by Dan Flavin. (1976) A rod of colored fluorescent tubes creates a gradation of yellow, green and blue in the corner of a room. Similar gradation effect was achieved at large at the Hauserman Showroom. (1982)
PhotoCrd: Peter Weibel and Gregor Jansen ed. Light Art from Artificial Light, (Ostfildern, Deutschland : Hatje Cantz, 2006): 549.

Figure 3.3.6 Hauserman Showroom, corridor lighting designed by artist Dan Flavin.
PhotoCrd: Interior Design, May 1982, 147.

His art created a volume of space that is intensely lit by one or more hued fluorescent light tubes. (See Figure 2.3.5) Flavin's first permanent installation appeared in the Sunar Hauserman showroom (1982). Hired by showroom designer Massimo Vignelli, Flavin used Chameleon to create a corridor that "obliterated the difference between floor and ceiling, walls and the whole thing"[11]. (See Figure 2.3.6)

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[10] Jeffery Weiss, "Preface," in *Dan Flavin: A Retrospective* ed. Michael Govan and Tiffany Bell (New York: Dia Art Foundation, 2004), 10.
[11] Christine Rae, "Market Memorabilia: West Week," *Leading Edge 2* (1982),

Besides Dan Flavin, the experience of colored light space was a major theme of work of Light Artists in 1960s such as James Turrell and Bruce Naumann, whose work also involved saturated environments. ‘Gard’ (1967) and ‘Solid Afrum’ (1970) by James Turrell composed an image of pyramid and a cube through colored spot light posed on at the edge of walls. In these colored spaces, controlled amount of light distinguishes the subject and the background. (See Figure 2.3.7)

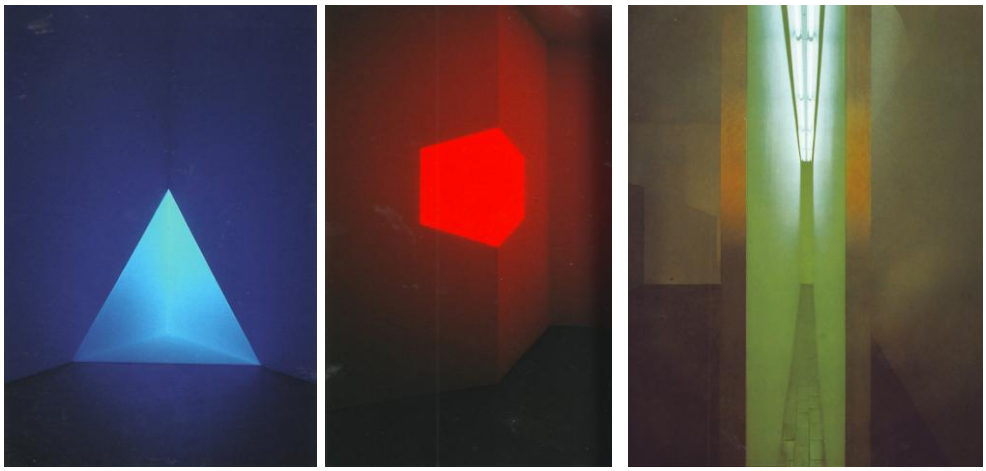

Figure 3.3.7 Left showing a blue pyramid is ‘Gard’ (1967) and the middle showing a red cube is ‘Soild Afrum,’ (1970) both pieces by James Turrell. PhotoCrd: Peter Weibel and Gregor Jansen ed. Light art from artificial light, (Ostfildern, Deutschland; Hatje Cantz, 2006): 283.

Figure 3.3.8 ‘Green Light Corridor’ (1967) by Bruce Nauman. Viewers are encouraged to peak into or maneuver through tight corridor space drenched with green light.
PhotoCrd: Peter Weibel and Gregor Jansen ed. Light art from artificial light, (Ostfildern, Deutschland; Hatje Cantz, 2006): 299.

Bruce Nauman’s ‘Green Light Corridor’ is an intense spatial experience of colored space; the narrow width of the corridor intensifies the immersion under the green light. The Light Art in 1960s was the discovery of saturated space

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60-61.

through manipulation of lighting, which led to archetypical interior practice of Color Flood and Chameleon.[12] (See Figure 2.3.8)

Technology of Chameleon

Changing colored lighting was accomplished by use of fiber optic technology which began in the late 1980s until the practical use of light-emanating diodes (LED) became available. Fiber optics are thin glass tubes that effectively refract lights rays and transmit light from one end to the other. Usually, a single source of light is placed in a convenient spot and the light rays are carried through these flexible glass tubes to their destination.[13] The tubes are covered in an opaque material to prevent light leakage. Despite its apparent advantages such as small sizes, less energy use and long life, LEDs were not popular in the beginning because the wavelength range was limited and only emitted amber to red light. The spectrum of blue to green was achieved in 1993, which led to the limitless opportunity to utilize colored artificial light in the interior.[14] LED lamps replaced many fluorescent and incandescent light sources, as well as exit signs. Placed in a plastic tube, LEDs also emulate the effect of neon. The majority of Chameleon installations in the late twentieth century onward utilized LED lamps because of their multiple benefits for longevity, low energy consumption, and their petite size. LEDs enabled lighting designers and manufacturers to easily retrofit new fixtures into existing

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[12] Kwan, Joanne. *Theory Studies: Archetypical Artificial Lighting Practices in Contemporary Interior Design*, 93.
[13] Gersil N. Kay, *Fiber Optics in Architectural Lighting: Methods, Design, and Application* (New York: The McGraw-Hill Companies, 1999), 21.
[14] Robert S. Simpson, *Lighting Control – Technology and Applications*, 154-156.

structures and to better control light distribution. For architects and designers, LED lamps provided maximum flexibility and customization which produced better and more diverse aesthetic solutions. When encased behind translucent material, LED lamps enabled built environments to ultimately become 'sources' of light in their own right.[15] Chameleon is achieved when this source lighting changes from one color to another. Current technology of the Color Changing LED, such as LED Light Strips, provides many options for colorization schemes as well as intensity and speed of modification. The actual controlling of lighting happened through the electrical switching device or a master control until computer programming became possible.[16]

Chronological Sequence

For a renovation of the Milanese Apartment, designed by Luigi Bonetti, (originally constructed in 1901, renovated in 1987), the architect was challenged with a lengthwise corridor leading to different rooms in a quarter. Chameleon was the solution for 'updating' the corridor space while respecting the traditional layout and leaving it structurally unaltered. The effect achieved by having three options of colored neon lights in blue, yellow, and red. The colors leaked to rooms attached to the corridor creating a frame piece of color blotch. The space could be painted with different colored light at any instant. (See Figure 2.3.9)

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[15] Mark Major et al., *Made of Light: The Art of Light and Architecture* (Basel, Switzerland: Birkhauser, 2005), 111.
[16] Robert S. Simpson, *Lighting Control – Technology and Applications*, 280, 332.

Figure 3.3.9 Apartment in Milan designed by Luigi Bonetti. (1987) The top views are identical showing an entrance to the color changing corridor. Corridor rendered in blue, yellow and red lights are shown on the bottom. PhotoCrd: Interior Design, Jan. 1987, 245.

In the same year, architect Helmut Jahn surprised the world with his dramatic design of the United Airlines Terminal at Chicago's O'Hare International Airport. (1987). The 815-foot tunnel that connected the two concourses took seven minutes to walk. To make the transit more tolerable, artist Michael Hayden designed a kinetic light environment that had continuously changing lighting.[17] The use of Chameleon effectively solved spatial problems commonly associated with the long circulation path typically found in airports by creating a sense of speed and movement. (See Figure 2.3.10)

[17] Brian Walters, "Helmut Jahn has completed the "terminal for tomorrow" for United Airlines at O'Hare airport," *Building Design* no.858 (1987), 30-33.

The Edward H. McNamara Gateway, Detroit Metro Airport (2002) designed by Fred L. Smith of Smith Group, subsequently used Chameleon to entertain passengers with corridors of rhythmic-changing colored lights. The tunnel design was a response to Northwest Airline's desire to dramatically elevate their customers' experience entering a long narrow, windowless space.[18] The entertaining and surreal environment was created through a continuous morphing of visual effects, brightness and color saturation using custom designed LED light fixtures. Thousands of small LEDs are mounted behind curved glass panels and they can render an infinite number of programmable and animated color light. Not only relieving the tension of moving through a long windowless tunnel, the sensory experience of McNamara's lighting design provides visitors with a simulation that influences mood and time. (See Figure 2.3.11)

Figure 3.3.10 Terminal for tomorrow for United Airlines at O'Hare airport by Helmut Jahn.
PhotoCrd: Architectural Record, Nov. 1987, 152.

Figure 3.3.11 McNamara Tunnel, Detroit Metro Airport by SmithGroup. Curved glass panels encasing LED lights reflect and refract changing color rays onto the ceiling and the floor.
PhotoCrd: Architectural Design Sep.-Oct. 2005, 28.

[18] Christina Trauthwein, "Terminal Bliss: McNamara Terminal Pedestrian Tunnel," *Architectural Lighting* (Jan.-Feb. 2003), 11.

In his design for the Mondrian Hotel lobby in Los Angeles (1997), developed by Schrager, Philippe Starck employed Chameleon to enhance the dining experience. (See Figure 2.3.12) Automated changes in light chromatics made the room appear to gradually fluctuate between green, cyan, red and violet. Enlivening the lobby area was a design strategy to defy the spatial limitation of the 9-foot ceiling. The lighting design corresponds to California's natural light shifts throughout the day. "During daylight hours, much of the lobby is bathed in an orange glow that, as evening approaches, gives way to a computer-programmed series of colors."[19] When windows are not available, Chameleon suggests a change in time over the course of a day.

Figure 2.3.12 The Lobby at the Mondrian Hotel. Same views are shown under different colored lighting.
PhotoCrd: Interior Design, Mar 1997, 107.

[19] Edie Cohen, "L.A. Boogie-Woogie," *Interior Design* 68, no. 4 (1997): 107.

At Morimoto, Philadelphia (2002) by Karim Rashid, color changing light boxes in addition to spatial lighting constantly alter the room's hue. Each dining table area is partitioned with half-height frosted boxes of plate glass housing LED strips underneath.

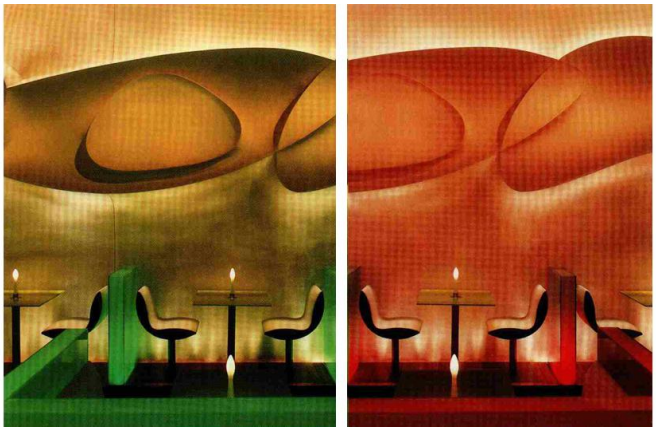

Figure 2.3.13 Dining area of Morimoto under green light and red light. PhotoCrd: Interior Design, Feb. 2002, 160.

This light box projects a soft glow of color "cycling between cyan, magenta, green, orange, and lavender at a pace so slow that the shift barely registers at a conscious level."[20] The closeness to the changing light source provides restaurant patrons an opportunity to be stimulated directly by the light source. (See Figure 2.3.13 and 2.3.14) The lighting cycle at Morimoto is based on slow transformations between six main colors on a two hour time frame.[21]

[20] Craig Kellogg, "Chef's Choice," *Interior Design* 73, no. 2 (2002): 158.
[21] Robert S. Simpson, *Lighting Control – Technology and Applications*, 465.

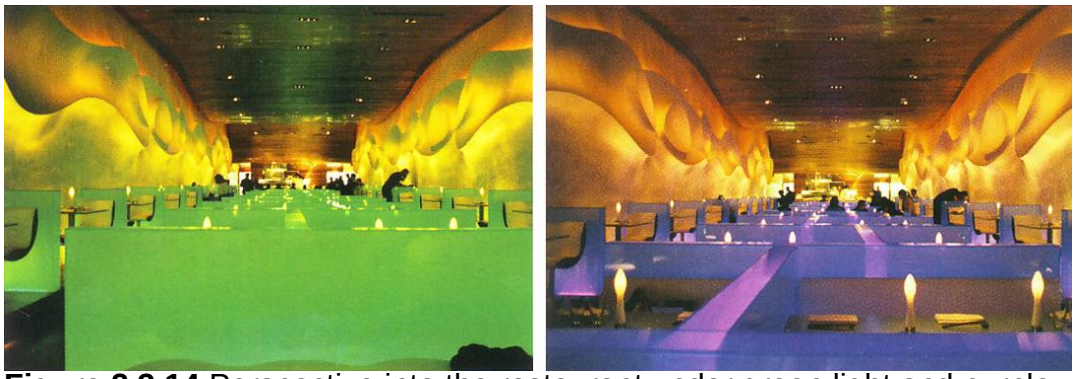

Figure 2.3.14 Perspective into the restaurant under green light and purple light. The atmosphere of the restaurant dramatically changes.
PhotoCrd: Robert S. Simpson, Lighting Control – Technology and Applications, (Oxford, UK: Robert S. Simpson, 2003), 465.

Chameleon's advantage of transforming a space also led to its appearance in the healthcare sector. Dr. Anthony Galvan's Dental Office in San Ramon, California (2003) has elliptical operatories enclosed by fiber optics integrated acrylic panels. The designer, Michael Logue from Logue Studio Design, composed orange, green, and blue color fields which are constantly fusing and changing to render a three dimensional artistic interpretation based on Mark Rothko's paintings. The lights can be programmed to change at any interval of time; "manual-adjustment and continual-loop options confer additional flexibility."[22] (See Figure 2.3.15)

LED lights could be encased within a translucent wall to create an effect that the wall is itself a changing colored light bulb, as seen in the Amsterdam retail interior of Shoebaloo (2003) designed by Schooten. (See Figure 2.3.16) "The interstitial zone between the fuselage and outer walls houses more than 600 fluorescent tubes in four colors with nearly 100 dimmers; capable of infusing

[22] Edie Cohen, "Healthcare; Under the Influence," *Interior Design* 74, no. 14, (2003): 90.

the translucent shell with all conceivable colors, in combinations and intensities determined by ten computer programs the staff can select".[23]

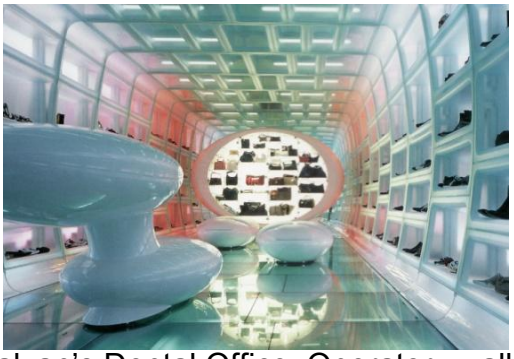

Figure 3.3.15 Dr. Anthony Galvan's Dental Office, Operatory walls change color through fiber optics inside acrylic panels. PhotoCrd: Interior Design, Nov. 2003, 88.

Figure 3.3.16 Inside Shoebaloo, Amsterdam, Netherland. Colors gently shift with diffuse illumination to create 'breathing-like' effect. PhotoCrd: Architectural Record, Sep. 2003, 123.

The power of stimulation of Chameleon was also recognized by designers at Gensler for the IBM e-Business Center in London, UK. (2005) The facility, which consists of a series of presentation spaces, meeting rooms, creative workshop spaces and office support areas, encourages creative thinking and the production of innovative solutions. The flexible lighting scheme was a strategic component of the interior design, in which Chameleon was implemented so "visitors never see any space in the same way twice."[24] Among these spaces, Think Tank space was especially designed for brainstorming. LED units generated multiple colors and pattern projection onto

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[23] Tracy Metz, "With sleight of hand, Meyer en Van Schooten inserts its luminously futuristic store into a 19th-century building in Amsterdam," *Architectural Record* 191, no. 9, (2003): 124.

[24] Mark Major et al., *Made of Light: The Art of Light and Architecture* (Basel, Switzerland: Birkhauser, 2005), 117.

a circular wall surface that turned the room into a hub of creativity. The speed of changing light is barely perceptible to avoid psychedelic atmosphere. (See Figure 2.3.17)

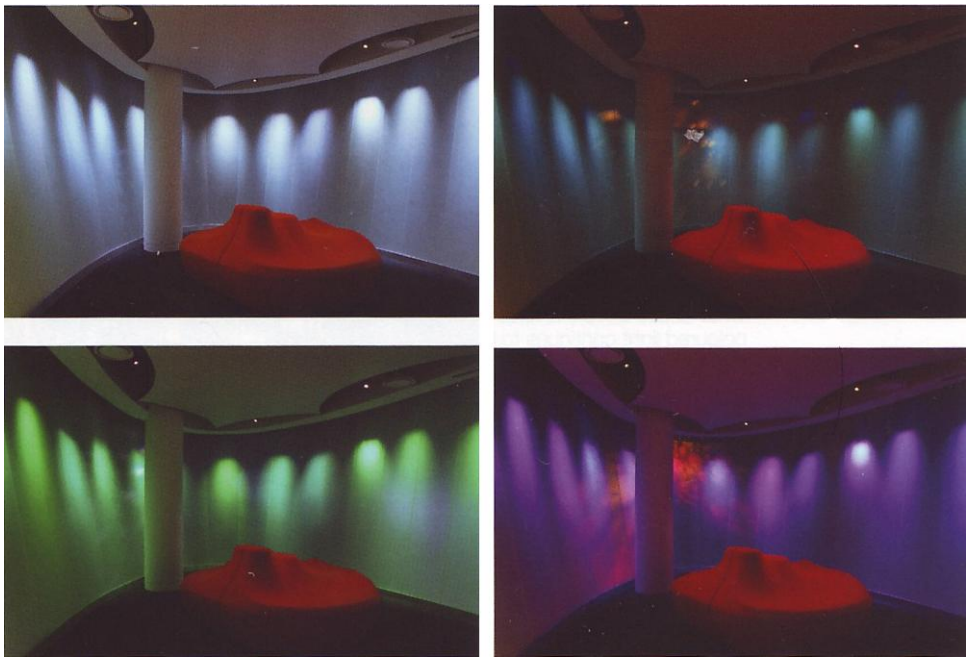

Figure 3.3.17 The Think Tank space at IBM e-Business Center in UK designed by Gensler. (2005)
PhotoCrd: Mark Major et al., Made of Light: The Art of Light and Architecture (Basel, Switzerland: Birkhauser, 2005) 116.

The application of Chameleon with LEDs proves to be an effective historical renovation installation tactic. When designers use Chameleon in historical buildings, such as the Musee des Art Decoratifs (1905, renovated in 2006) inhe northwest wing of the Louvre, it results in a high-impact renovation. The ten-year renovation of the Musee des Art Decoratifs included an installation of seven inflatable LED sculptural chandeliers that hung from the occults in the great hall. The chandelier was the product of an arduous experiment and cooperation between Herve Descottes and Dubuisson Architects. Descottes

and Dubuisson created inflated PVC tubes with LEDs inside. Frosted PVC strips forming the shape of a rose were sewn into the inflated tube to reflect the color of LED lights. At noon every day, the fixtures are white, but they can be programmed for 10,000 individual colors and color combinations.[25] (See Figure 2.3.18)

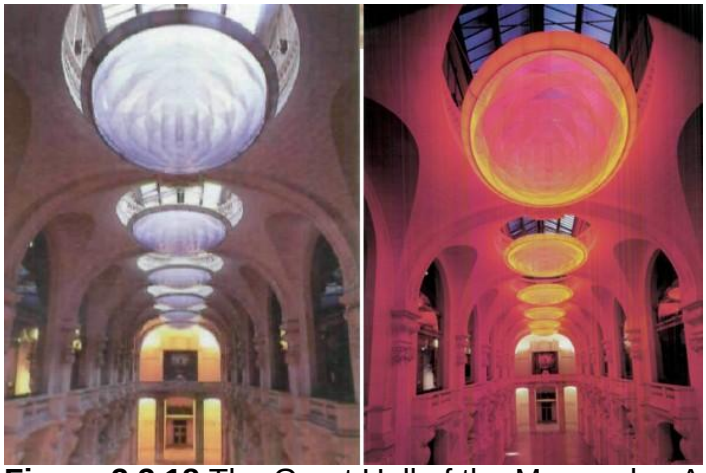

Figure 3.3.18 The Great Hall of the Musee des Art Decoratifs, 2006. PhotoCrd: Judy Fayard, "Belle Epoque Goes High-tech," Interior Design 78, Nov. 2007, 328.

From the 1960s to the present, Chameleon has been used in various types of interiors, where changing light schemes were necessary in creating extraordinary spaces. Designing these environments often involved inspiration from art or collaboration with light artists who had an expertise of using colored light in an expressive manner. These orchestrated transformations create a visual spectacle, often reaching beyond various spatial limitations. Thus, Chameleon has been widely practiced in restaurants, workplaces, retail,

[25] Judy Fayard, “Belle Epoque Goes High-Tech,” *Interior Design* 78, no. 14, (2007): 329.

healthcare, and even at historic museum settings as suggested by the breadth of evidence found in trade magazines.[26]

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[26] Evidence for the archetypical use and the chronological sequence of Chameloen in Transformative Interior was developed from the following sources: **1960** Cerebrum Night Club [1968] John Storyk; New York, NY in Alastair Gordon, “What a Long Strange Trip It’s Been,” *Interior Design* 78, no. 3 (Mar. 2007): 354; PhotoCrd: John Storyk; **1980** Hallway, Hauserman Showroom [1982] Massimo Vignelli / Dan Flavin; New York, NY in Massimo Vignelli, “Market Memorabilia: West Week, Excerpts from Your Turn My Turn, the second annual designer symposium led by architect Richard Saul Wurman at West Week,” *Leading Edge a Sunar Magazine* 2 (Oct. 1982): 61; Brian Walters, United Airline Terminal at O’Hare Airport [1987] Michael Hayden and Helmut Jahn; Chicago in “Helmut Jahn has completed the "terminal for tomorrow" for United Airlines at O'Hare airport,” *Building Design* n.858 (1987): 32; Apartment [1986] Luigi Bonetti; Milano, Italy in *Interior Design* 57, no. 1 (Jan. 1986): PhotoCrd: Marina Papa; United Airlines Terminal, O'Hare Airport [1987] Murphy Jahn; Chicago, IL in Sylvan R. Shemitz, "Lighting the way: United Airlines Terminal O'Hare International Airport, Chicago," *Architectural Record* 175 no. 13 (Nov. 1987): 152, 153; PhotoCrd: Steinkamp/ Ballogg Chicago; **1990** Restaurant at Mondrian Hotel [1997] Phillip Starck; Hollywood, CA in Edie Cohen, “L.A. Boogie-Woogie,” *Interior Design* 68, no. 4 (Mar. 1997): 107; PhotoCrd: Toshi Yoshi; A Dance Floor [1996] Piotr Uklanski in David Rimanelli, “If You Lived Here…,” *Interior Design* 70, no.10 (Aug. 1999): 176; PhotoCrd: Gavin Brown’s Enterprise, New York; Façade, Schrager Hotel [1999] Phillippe Starck and Anda Andrei; London, UK in Melissa Barrett Rhodes, “Room with a Hue,” *Interior Design* 71, no. 1 (Jan. 2000): 122; PhotoCrd: Todd Eberle; Bar, Shoreham Hotel [1999] Pasanella + Klein Stolzman + Berg; New York, NY in Monica Geran, “Welcome to Gotham,” *Interior Design* 71, no. 12 (Oct. 2000): 248; PhotoCrd: Paul Warchol; **2000**

Restaurant Morimoto [2002] Karim Rashid; Philadelphia, PA in Craig Kellogg, “Chef’s Choice,” *Interior Design* 73, no.2 (Feb. 2002): 160; PhotoCrd: David Joseph; George Patterson Bates [2002] Whittaker Hadenham Openshaw and Mark Marin; Sydney, Australia in Jen Renzi, “Getting Down, Down Under,” *Interior Design* 73, no. 7 (Jul. 2002): 200; PhotoCrd: Marcus Clinton; McNamara Tunnel, Detroit Metro Airport [2003] Smith Group; Detroit, MI in Christina Trauthwein, "Terminal Bliss: McNamara Terminal Pedestrian Tunnel," *Architectural Lighting* (Jan.-Feb. 2003): 10, 11; PhotoCrd: Justin Maconochie; Dental Clinic [2002] Logue Studio Design; San Ramon, CA in Edie Cohen, "Under the Influence," *Interior Design* 74, no. 14 (Nov. 2003): 88; PhotoCrd: Michael O’Callahan; Shoebaloo [2003] Meyer en Van Schooten; Amsterdam, Netherlands in Tracy Metz "With Sleight of hand, Meyer en Van Schooten Inserts its Luminously Futuristic Store into a 19th Century Building in Amsterdam," *Architectural Record* 191, no. 9 (Sep. 2003): 123; PhotoCrd: Jeroen Musch; D-Edge [2003] Muti Randolph; Sao Paulo, Brazil in Jennifer Hudson, *Interior Architecture Now* (London; Laurence King Publishing Ltd, 2007), 255; PhotoCrd: Laurence King Publishing Ltd.; Bar A60 [2004] David Collins; London, UK, in Stephen Milioti, "Change is Good," *Interior Design* 75, no. 10 (Aug. 2004): 181; PhotoCrd: Adrian Wilson; Conference Room, Una Hotel [2004] Fabio Novembre; Florence, Italy, in Donna Paul, “Life’s Rich Tapestry,” *Interior Design* 75, no. 1 (Jan. 2004): 226; PhotoCrd: Alberto Ferrero; J.S. International Showroom [2004] Stamberg Aferiat Architecture; New York, NY in Raul Barreneche, “Label Conscious,” *Interior Design* 75, no. 11 (Sep. 2004): 240; PhotoCrd: Paul Warchol; The Think Tank Space, IBM e-Business Center [2005] Speirs and Major Associates; London, UK in Mark Major, Jonathan Speirs, and Anthony Tischhauser, *Made of Light: The Art of Light and Architecture* (Basel, Switzerland; Birkhauser, 2005), 116; PhotoCrd: Tim Soar; Stripsteak [2007] Super Potato; Las Vegas, NV in Kurt Handlbauer, “Meat and Potato,” *Interior Design* 78, no. 2 (Feb. 2007): 147; PhotoCrd: Eric Laignet; Creative Artists Agency (CAA) [2007] Gensler; Los Angeles, CA in

Edie Cohen, “Stairways to the Stars,” *Interior Design* 78, no. 7 (May 2007): 257; PhotoCrd: Benny Chan / Fotoworks; Musee Des Art Dcoratifs [2007] Herve Descottes and Dubuisson Architects; Paris, France in Judy Fayard, "Belle Epoque Goes High-tech," *Interior Design* 78, no. 14 (Nov. 2007): 328; PhotoCrd: Eric Laignel; International Interior Design Association Headquarter [2008] Envision; Chicago, IL in Jay Pridmore, “Walk Through: Designing for Designers,” *Interior Design* 79, no 7 (May 2008): 130; PhotoCrd: Eric Laignel; Lobby of Fornari Headquarter [2008] Giorgio Burruso Design; Milan, Italy in Nicholas Tamarin, "Giorgio Burruso Design," *Interior Design* 79, no. 15 (Dec. 2008): 110; PhotoCrd: Alberto Ferrero; Greenhouse [2009] Bluarch Architecture + Interiors + Urban Planning; New York, NY in Edie Cohen, "Best of Year: Bar / Lounge," *Interior Design* 80 no. 15 (Dec. 2009): 58; Christobal Palma; Port Authority Bus Terminal [2009] PKSB Architects and Leni Schwendinger Light Projects; New York, NY in *Interior Design* 80 no. 15 (Dec. 2009): 90; PhotoCrd: Eduard Hueber / Arch Photo; **2010** Residence of Tim Hooson [2010] Tim Hooson / Jasmax; Aukland, New Zealand in Peter Webster, "Marine Life," Interior Design 81, no. 1 (Jan. 2010): 100;

1980S

Title | **Hauserman Showroom**
Credit | Toshi Yoshimi

Hallway, Hauserman Showroom [1982]
New York, NY
Design | Massimo Vignelli / Dan Flavin

Copyright Citation |
Hallway, Hauserman Showroom [1982] Massimo Vignelli / Dan Flavin; New York, NY in Edie Cohen, “Light Show,” Interior Design 53, no. 7 (Jul. 1982): 147; PhotoCrd: Toshi Yoshimi;

1980S

Title | **Milanese Apartment**
Credit | Marina Papa

Apartment [1986] Milano, Italy
Design | Luigi Bonetti

Copyright Citation |
Apartment [1986] Luigi Bonetti; Milano, Italy in Edie Cohen, “Lighting Effects,” *Interior Design* 58, no. 1 (Jan. 1987): 245, plate 5,6,7; PhotoCrd: Marina Papa;

Figure 3.3.19 Chameleon: Photographic Timeline

Figure 3.3.19 (continued)

1990S

Title | **Mondrian Hotel**
Credit | Toshi Yoshimi

Mondrian Hotel [1997] West Hollywood, CA
Design | Phillip Starck

Copyright Citation |
Mondrian Hotel [1997] Phillip Starck; West Hollywood, CA, in Edie Cohen, "L.A. Boogie-woogie," Interior Design 68, no. 4 (Mar. 1997): 107, plate 2; PhotoCrd: Toshi Yoshimi.

Figure 3.3.19 (continued)

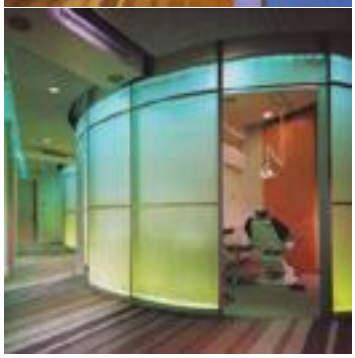
2000s

Title | **Bar, Shoreham Hotel**
Credit | Paul Warchol

Bar, Shoreham Hotel [1999] New York, NY
Design | Pasanella + Klein Stolzman + Berg

Copyright Citation |
Bar, Shoreham Hotel [1999] Pasanella + Klein Stolzman + Berg; New York, NY in Monica Geran, “Welcome to Gotham,” *Interior Design* 71, no. 12 (Oct. 2000): 248; PhotoCrd: Paul Warchol;

2000s



Title | **Dental Clinic**
Credit | Michael O’Callahan

Dental Clinic [2002] San Ramon, CA
Design | Logue Studio Design

Copyright Citation |
Dental Clinic [2002] Logue Studio Design; San Ramon, CA in Edie Cohen, "Under the Influence," Interior Design 74, no. 14 (Nov. 2003): 88, plate 1,2,4; PhotoCrd: Michael O’Callahan.

Figure 3.3.19 (continued)

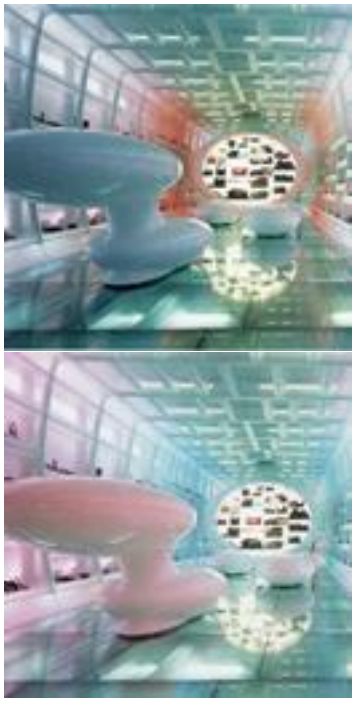
2000s

Title | **McNamara Airport Terminal**
Credit | Justin Maconochie

McNamara Airport Terminal [2003] Romulus, MI
Design | Smith Group

Copyright Citation |
McNamara Airport Terminal [2003] Smith Group; Romulus, MI in John Gallagher, "McNamara Terminal, Detroit Metro Airport, Romulus, Michigan," Architectural Record 191 no. 8 (Aug. 2003): 144, plate 1; PhotoCrd: Justin Maconochie;

2000s



Title | **Shoebaloo**
Credit | Jeroen Musch

Shoebaloo [2003] Amsterdam, Netherlands
Design | Meyer en Van Schooten

Copyright Citation |
Shoebaloo [2003] Meyer en Van Schooten; Amsterdam, Netherlands in Tracy Metz "With Sleight of hand, Meyer en Van Schooten Inserts its Luminously Futuristic Store into a 19th Century Building in Amsterdam," Architectural Record 191, no. 9 (Sep. 2003): 123, plate 2,3,4; PhotoCrd: Jeroen Musch

Figure 3.3.19 (continued)

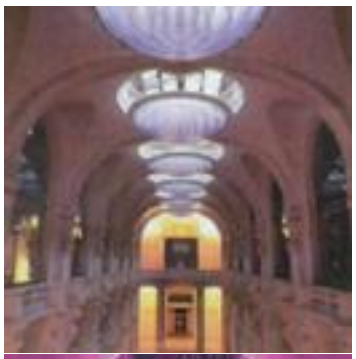
2000s

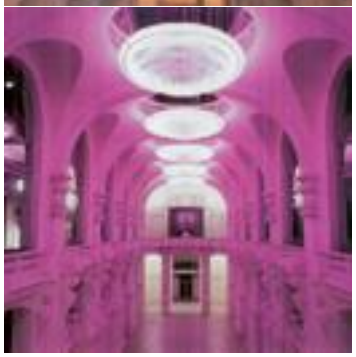
Title | **Creative Artists Agency**
Credit | Benny Chan / Fotoworks

Creative Artists Agency (CAA) [2007] Los Angeles, CA
Design | Gensler;

Copyright Citation |
Creative Artists Agency (CAA) [2007] Gensler; Los Angeles, CA in Edie Cohen, “Stairways to the Stars,” *Interior Design* 78, no. 7 (May 2007): 257, plate 2,3; PhotoCrd: Benny Chan / Fotoworks;

2000s





Title | **Musee Des Art Dcoratifs**
Credit | Eric Laignel

Musee Des Art Dcoratifs [2007] Paris
Design | Herve Descottes and Dubuisson Architects

Copyright Citation |
Musee Des Art Dcoratifs [2007] Herve Descottes and Dubuisson Architects; Paris, in Judy Fayard, "Belle Epoque Goes High-tech," *Interior Design* 78, no. 14 (Nov. 2007): 328, plate 2,4,5,7,8; PhotoCrd: Eric Laignel

Figure 3.3.19 (continued)

2000s

Title | **Lobby of Fornari Headquarter**
Credit | Alberto Ferrero

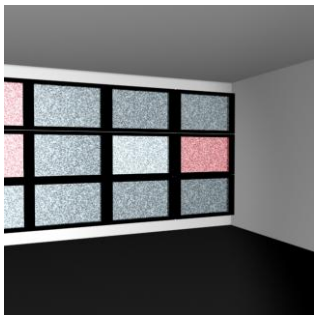
Lobby of Fornari Headquarter [2008]
Milan, Italy
Design | Giorgio Burruso Design

Copyright Citation |
Lobby of Fornari Headquarter [2008]
Giorgio Burruso Design; Milan, Italy in Nicholas Tamarin, "Giorgio Burruso Design," Interior Design 79 no. 15 (Dec. 2008): 110, plate 1, 2; PhotoCrd: Alberto Ferrero

3.4 Pulsate

InType

Pulsate



Definition

Pulsate describes a group of monitors that create a visually active and animated plane. The effect achieved by the contents projected through the monitors constantly alters the spatial experience through light, sound, motion, and passage of time. Pulsate can also be installed as an electronic billboard, an entire wall plane made of monitors.

Effect

Pulsate utilizes linear or grid organization of monitors to produce a visually and sometimes acoustically stimulating space. Occupying an area of an interior plane, each monitor acts as a module to create a larger channel of sensory input, such as light and sound, into the space. As the scale of installation increases, these monitors may become a wall, floor, ceiling or a column entirely built of monitors. The degree of impact depends on the scale and

composition of installation, relationship with surrounding architectural elements and contents conveyed. The dance club ‘Point After’ on the Carnival Destiny cruise liner (1996) designed by Wynne Wilson Gottelier is a great example of Pulsate. Monitors are stacked together to form walls and suspended ceiling panels. Psychedelic images are played on these screens, which provided ever changing pattern of colors and shapes.

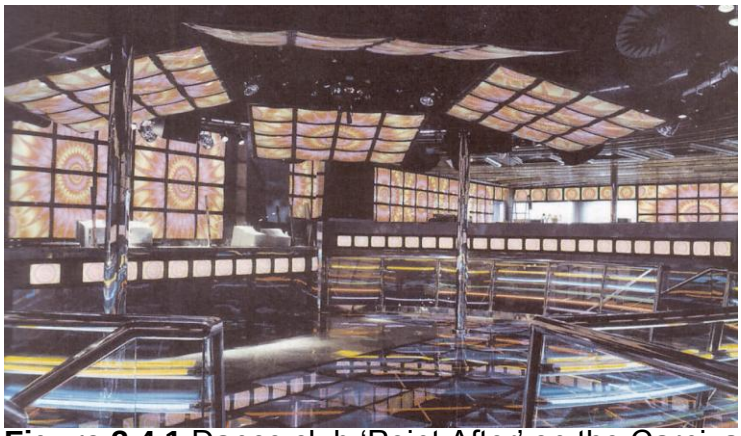


Figure 3.4.1 Dance club ‘Point After’ on the Carnival Destiny cruise liner (1996) designer by Wynne Wilson Gottelier. Monitors are mounted to create a wall and ceiling. The floor is a reflective surface, mirroring the monitors hung from the ceiling, creating a monitor surrounded environment.
PhotoCrd: Robert S. Simpson, Lighting Control – Technology and Applications, (Oxford, UK: Robert S. Simpson, 2003), 171.

Pulsate also addresses the passage of time making the space it occupies four-dimensional. When monitors show broadcasted material or a live feed, an immediate sense of time is present in the space. Videos or prerecorded images demonstrate the constant passage of time through movement on the screen. Live images tend to convey an imminent atmosphere when contrasted with pre-recorded visuals.

Certain conditions of Pulsate are reminiscent of the effect of Chameleon. When adjacent planes are made of reflective materials, such as polished hardwood or metallic surface, the screen-glow echoes colored light into the space. Although not as intense as Chameleon, monochromatic palette of surrounding planes housing luminous planes created by monitors also mirror the colors transmitted. Among the chronological examples discussed, Morimoto in Philadelphia demonstrates this hybrid quality.

The following research examines the significance of this display device in the interior environment and the archetypical development of Pulsate.

Technology

Pulsate as a light source conveys movement depending on the pace of image change. The technological root of this phenomenon can be found in strobe light, or stroboscope known as in the US patent of 1,478,903 by H.E. Edgerton in 1933. A stroboscope generates succinct, repeating bursts of light, which allow viewers to see the movement of objects in a series of static images, while inducing dynamic spatial atmosphere. The invention was used to study motion in a visually segmented way. The idea of controlling the pace of time was translated into Pulsate, especially when constantly blinking images though display devices heightened the level of visual stimulation in the space.

Monitors and screens have become ubiquitous display devices in commercial and institutional settings. This phenomenon started with television, an image transmitting machine that found wide appeal in American households for entertainment. However monitors which supply information and image display

occur in numerous settings such as medical, educational, security, as well as for pure decoration. Recent technology has also allowed users to be engaged in two-way communication rather than being passive spectators. Video conference is a good example of a communication event established between two parties through monitors. The touch-screen technology proved to be a key mechanism in human and machine interface. ATM machines, PDAs, and mobile phones allow automated navigation of resources.

Among the many display technologies, Cathode Ray Tube (CRT), a component of traditional television, Liquid Crystal Display (LCD) and Plasma Screen Display (PSD) are the most commonly utilized practices. The cathode ray tube was the first entity to deliver visually broadcasted materials. In 1897, German scientist named Karl Braun invented the main component of the cathode ray tube, which is a specialized vacuum tube that can transfer refracted electron beams into images. Three decades later, in 1927, American inventor Philo Farnsworth filed a patent for a device that transmitted an image using six horizontal lines on a screen. However, in order to perfect the system, he needed significant funding. The Radio Corporation of America (RCA) paid Philo Farnsworth one million dollars for the rights to his patents, although they had an in-house inventor, Vladimir Zworykin, a Russian physicist who filed a patent in 1938. Both Zworykin and Farnsworth are credited for the invention of television.[27]

[27] Albert Abramson, *The History of Television*, 1880 to 1941, (North Carolina: Albert Abramson, 1987): 34.

The Cathode Ray Tube dominated television manufacturing industry since its invention, while Plasma display and Liquid Crystal Display struggled to become viable alternatives due to high production costs. The Plasma Display Panel was invented in 1964 at the University of Illinois by Donald Bitzer, Gene Slottow and Robert Willson. Plasma displays contain noble gases sandwiched between two glass screens. It is used for large display areas covering up to 12.5 feet diagonally, which was impossible for a CRT monitor to achieve. Plasma display is dramatically used in high-profile lobbies and stock exchanges despite the steep cost. The consumer-grade color plasma screen was first developed by Fujitsu in 1992.[28] In mid 2000, as production costs significantly diminished, the Plasma television market became substantially larger.

Conceived in the early 1900s, LCD technology did not become fully commercialized until the end of that decade. Used for small personal appliances, such as digital clocks, calculators, CD players, computer monitors and equipment panels, LCD screens now widely appear in many everyday devices. A Liquid Crystal Display is essentially a thin, flat electronic visual display that uses the light modulating properties of liquid crystals. Color LCD television was developed in 1970s and wide spread production started in the late 1990s. In 2007, sales of LCD televisions surpassed that of the Cathode Ray Tube televisions for the first time. Compared to the cathode ray tube

[28] K. Awamoto et al, “Progress in Large Screen Plasma Display and New Approach for Extra-large Screen System with Plasma Tube Technology,” *Journal of Display Technology* 2, no. 4 (Dec. 2006): 679.

technology, the thin screen made image display lightweight, larger, and more portable.[29]

With first commercial “LED TV” from Sony in 2004, LCD technology has been further developed to use LED backlights instead of fluorescent lights. This enabled the TV manufactures to produce even thinner and lighter screens, which fueled the race to produce the thinnest TV in the world. The current title holder is LG Display’s new television debuted in Las Vegas in 2010 with television that is less than 7 millimeters thick.[30] LED backlit TVs also provide the best image quality with contrast ratio surpassing 6,000,000:1. Major electronics companies including Samsung, LG, Toshiba, Sony, and Panasonic all have taken the “LED TV”s further to produce 3D TVs to consumers in 2010.

Studies and Statistics on Television

Sentiments, emotions and conditioned responses of television watching have greatly influenced how people respond to the presence of monitors in the interior and how the content is delivered. The ubiquitous nature and prevalence of monitors are obvious; nonetheless many studies and statistics attempt to measure the type and degree of impact that television has on its viewing public. This provides a background to understand the implications of incorporating monitors within interior spaces.

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[29] Yutaka Ishii, “The World of Liquid-Crystal Display TVs – Past, Present, and Future,” *Journal of Display Technology* 3, no. 4 (Dec. 2007): 351-351.
[30] CNN International Edition, “LG flat-screen TV gets skinny,” Jan. 10, 2010 http://www.cnn.com/2010/TECH/01/06/lg.flatscreen/index.html (Accessed June 14, 2010)

With the end of the World War II in late 1940s, the American economy was booming and many household enjoyed a more affluent life style which included watching television. In 1949, only 2 percent of American homes had a television set; a year later that figure had risen to10 percent. The ownership of television had an exponential growth; nearly all American homes owned a television by 1960.[31] The growth of broadcasting channels also ascended to include hundreds of cable and satellite offerings today.

Statistics in 1990 reveal that "the Average American spends about four hours a day watching television, with older adults watching the most of any group; even teenagers, who watch the least amount of television, still spend an average of nearly twenty-four hours a week in front of the TV set."[32] In 2008, the number of hours increased to five hours a day according to Nielsen, a leading research firm.[33] Numerous published studies are dedicated to how much people spend watching television, and the statistics points to the simple fact of the ubiquity and pervasiveness of television in modern life.

Monitors and screens in commercial interior started as functional and practical applications. Some merely attempted to recreate the ambience of living room, while others discovered ways to integrate informational monitors into interior design. Pulsate focuses on the latter examples, which create a luminous surface providing sound, motion, and a sense of time into the space. Breaking

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[31] Neilsen, A.C. *Nielsen Report on Television*, (Northbrook, IL: Nielsen, 1993)
[32] John Condry, *The Psychology of Television*, 31.
[33] The Nielsen Company, "Historical Daily Viewing Activity Among House Holds and Perons 2+," http://blog.nielsen.com/nielsenwire/wp-content/uploads/2009/11/historicalviewing.pdf (Accessed 4/27/10)

the conventional view of monitor as television was possible by Video Artists in the 1980s who offered creative means to think about monitors in space, and the possibilities of monitor displays in the interior.

Video Art: Monitor as Medium

Video artists were the first to discern monitors as a medium of art. Some focused on the manipulation of video images, while others created environment art, in which artists use monitor(s) to create sculptural installations for people to experience. Many demonstrations were intended to be within a space – in a corridor, staircase or on a column, multiples stacked to create a wall of monitors. Exploring the unique capability of monitor and recording devices, video artist provided new ways to experience and think about image display devices and their impact on interior space and the viewing audience. Many contemporary interiors with monitors were inspired by these art installations.

Nam June Paik is considered a pioneer in the genre of video art. Paik's work was sensational in that it challenged the established conventional relationship between art and those seeing art. Contrary to the experience of traditional sculpture, viewers are faced with unavoidable demand for attention and their sense of presence. The performers in his installation are the monitors, and each device display images that contributed to create visual drama in the space. Paik's work not only "animates the otherwise merely passive spectator,"[34] but also the spatial envelope, in which the monitors are housed.

[34] Wulf Herzogenrath et al., *Nam June Paik* (London: Hayward South Bank Board, 1988), 6.

(See Figure 2.4.1) The effect achieved was a constantly changing perception of the space. When the screens are directly embedded in architectural planes, the transformative quality of the room was intensified.

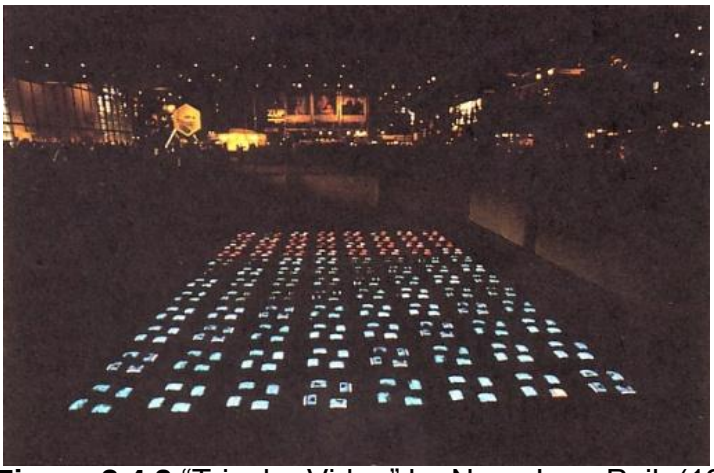

Figure 3.4.2 "Tricolor Video" by Nam June Paik (1982) Musee National d'Art Moderne, Centre Georges Pompidou, Paris. Micro-TVs embedded on the floor creates a video floor.
PhotoCrd: Wulf Herzogenrath et al., Nam June Paik (London: Hayward South Bank Board, 1988), 6.

Bruce Nauman's 'Corridor Installation' (1970) created a setting where one confronts a monitor within a narrow corridor that is thirty four feet long and twenty inches wide. The sight of monitors at the end of two walls lures curious viewers inside. The occupant soon discovers that the upper monitor is a live view of his or her own back. As one walks closer to the monitor to better see his or her own image, the image gets smaller because one is walking away from the camera. Most people instinctively turn back and again, hoping to see their own faces, but it is impossible. The person becomes active participant, or "victim" of the installation feeling frustrated, confused, or trapped - feelings that may be unpleasant but very familiar.[35] The monitors at the end of the corridor

[35] Barbara London, "Time as Medium: Five Artists' Video Installations,"

give viewers a reason to travel down the tight space. The anticipation and curiosity of discovering 'something' on the monitor makes one go inside despite the apparent physical discomfort. This is a good example of the use of anticipation – people are conditioned to find captivating imagery from television that the device itself has power to draw people in. (See Figure 2.4.2 and 2.4.3)

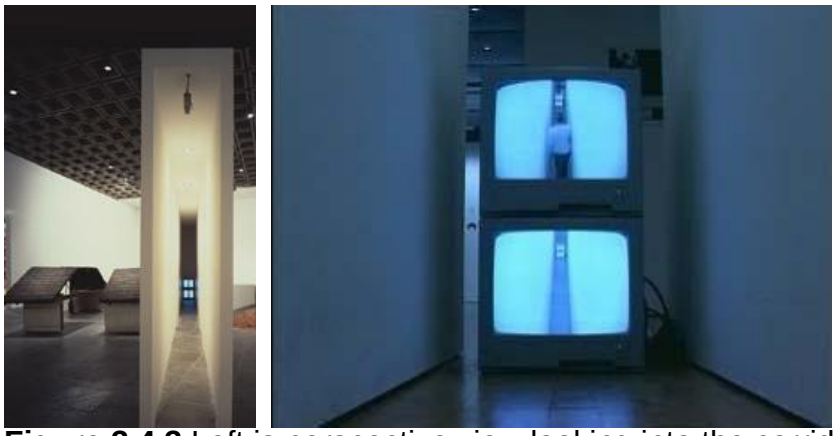

Figure 3.4.3 Left is perspective view looking into the corridor. Note the camera mounted at the entrance. Two screens are at the very end of the installation. 'Corridor Installation' by Bruce Nauman. (1970) at Guggenheim Museum, New York.
PhotoCrd:
http://www.mspmag.com/entertainment/museumsgalleries/144792.asp
(Accessed 4/22/2010)

Figure 3.4.4 Right shows the two monitors stacked together.
PhotoCrd: http://bridell.com/live-taped-video-corridor-1970 (Accessed 4/22/2010)

The technology of Closed-Circuit Televison (CCTV) made its appearance in the field of art when artist Vito Acconci made an installation art, "Command Performance" (1974). The audience was invited to 'act' and assume for themselves the role of performer. (See Figure 2.4.4) Claire Bishop in her book *Installation Art: A Critical History*, describes Acconci's work in detail:

Leonardo 28 no. 5 (The MIT Press, 1995)

> A closed-circuit television camera was trained upon the spot lit chair, filming whoever sat in it; in front of chair was a monitor playing a tape of Acconci inciting the visitors to step into the limelight and 'perform' for him/ herself. The camera linked the participants' image to a monitor positioned behind them at the entrance of installation – and which they would have seen upon entering. Viewers became both passive observers and active participants in the piece, watching Acconci on video while bringing the work to completion by sitting in the chair and 'performing' for other visitors who enter the installation.[36]

Acconci's work makes a commentary on the "to-see-and-be-seen" mentality prevalent in society. Some contemporary applications of Pulsate utilize the CCTV technology precisely to enhance a person's desire to be broadcasted at restaurants, bars and other social venues.

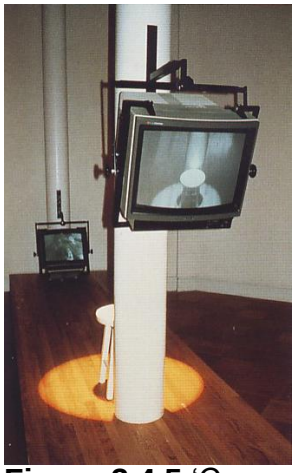

Figure 3.4.5 'Command Performance' by Vito Acconci (1974) New York. The monitor shows the view behind the colum. One can never see his or her own image, only the next person coming into the space.
PhotoCrd: Claire Bishop, *Installation Art: A Critical History* (New York: Routledge, 2005), 68.
Figure 3.4.6 'Duchampiana: Nude Descending a Staircase' by Shigeko Kubota (1976)
PhotoCrd: Museum of Modern Art, "The Collection," http://www.moma.org/collection/object.php?object_id=81792 (Accessed Apr. 25, 2010)

[36] Claire Bishop, *Installation Art: A Critical History* (New York: Routledge, 2005), 68.

Shigeko Kubota's work 'Duchampiana: Nude Descending a Staircase' (1976) is another work of monitor put into a spatial context. Reinterpretation of artist Marcel Duchamp's oil painting 'Nude Descending a Staircase,' Kubota's work also pays homage to Duchamp's notion of "transforming the boundaries of art by challenging the institutional definitions of the art object."[37] Her use of monitor as a medium was precisely meant to challenge the high art. Her use of monitor depicts the subject in a matter-of-fact way, which broadcasted material from television is often consumed.[38] (See Figure 2.4.5)

Using sixteen stacked television monitors, four video recorders, and a specially built, computer-controlled video switcher, 'Magic Wall' (1984) was a collaboration of artists Joanne Culver, Frank Dietrich, and Zsuzsanna Molnar. They intended to exhibit complementary or contradicting images in groups "to move beyond the limitations of everyday TV," which showed a single image on a screen. By controlling speed and rhythm of each screen, a matrix of video image patterns was created. Artists determined the rhythm and patterning of the 'Magic Wall' by writing computer programs that order the relationship of the images.[39] 'Magic Wall' was the first attempt of a wall entirely made of monitors – its scale and allusion to monitor as a building block inspired new approach to incorporating monitor in contemporary interior design. (See Figure 2.4.6)

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[37] John G. Hanhardt, "Video Art: Expanded Forms," *Leonardo* 23, no. 4 (The MIT Press, 1990): 437.
[38] Robert Smith, "Review / Art; Sleek Video Sculptures By Shigeko Kubota," *The New York Times*, May 24, 1991
[39] Joanne Culver, Frank Dietrich, and Zsuzsanna Molnar, "Magic Wall: A Multi-Monitor, Computer-Controlled Installation," *Leonardo* 17, no.2 (The MIT Press, 1984):88-89.

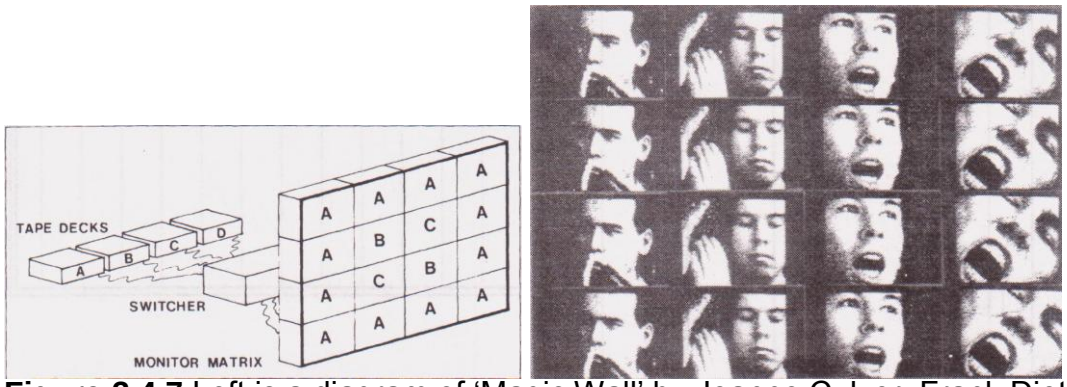

Figure 3.4.7 Left is a diagram of 'Magic Wall' by Joanne Culver, Frank Dietrich, and Zsuzsanna Molnar. (1984) Four tape decks go through switcher to display switching patterns of image projected onto the 16 monitors. Right shows images created. The images follow programmed pattern of change. PhotoCrd: Joanne Culver, Frank Dietrich, and Zsuzsanna Molnar, "Magic Wall: A Multi-Monitor, Computer-Controlled Installation," *Leonardo* 17, no.2 (The MIT Press, 1984): 88, 89.

Although the video art movement flourished during 70s and 80s, wide application of display devices in commercial interiors did not become economically feasible until the 1990s. Early technical challenges and steep budgetary costs posed some difficulty. Sizable control rooms, power requirements and the arduous production of video content made Pulsate an avant-garde interior feature. Nonetheless, designers found Pulsate a worthy investment: a timely and innovative approach to attract consumer attention, publicity, and cultivate brand identity.

Chronological Sequence: Monitors and the Interior

Barraging viewers with images and sounds, Pulsate reflects today's aggressive manner in which information is delivered. This trend fuses the demand for access to as much information available, and in the case of Pulsate, distribution via the spatial envelope. Pulsate is used to exhibit, broadcast, and reinforce highly scripted messages within an interior space, especially in corporate and retail interiors where strong brand identity is

desired. Used in restaurants and bars, Pulsate takes on a type of voyeurism which has become a social norm in contemporary society. Using abstract or literal imagery, Pulsate is also used for a purely decorative treatment, dictating the atmosphere of the space. In this case, the color, shape, form, and patterns appearing on the screen offer visual stimulation into the space, free of concrete messages.

Before the monitors made their appearance in commercial interiors, light boxes were used to create more dynamic spaces. The office of land developer Lewis Wolff (1983),designed by an architect Penni Paul, featured a wall of light box monitors with floor-to-ceiling modularized frames to provide a dramatic focal point in the room. (See Figure 2.4.7) Glowing, static images were meant to advertise and showcase the properties in more desirable manner. Blacked-out interior walls, upholstered chairs, and minimal lighting reminded one of being at the cinema. Light box installations paved the way in which animated images are displayed in Pulsate. Although static, stacked light boxes offer man-made scenery in place of windows, visually mimicking panes and mullions.


Figure 3.4.8 Office of Lewis Wolff designed by Penni Paul (1983). PhotoCrd: Monica Geran, “Executive Privilege,” *Interior Design* 54 (1983): 189.

Figure 3.4.9 Office of a company president by McCluskey Assoc. (1987) Pulsating wall is on the right.
PhotoCrd: Monica Geran, “Executive Privilege,” *Interior Design* 58 (1987): 197.

Pulsate first appeared in the late 1980s as indicated in a private office designed my Ellen McCluskey Associates (1987). (See Figure 2.4.8) One wall of the office presented sixteen monitors, flashing trading and marketing information.[40] The group of micro-sized monitors is reminiscent of square glass blocks often used in the interior as a light diffusing element. The overall effect of Pulsate provided an ever transforming vista that overturned at a rapid pace.

Beginning in the 1990s, Pulsate was employed for public display, enchantment, as well as an ‘interior window.’ Multiple screens formed a sizable display grid constantly transmitting promotional images and broadcasted jingles. As the proportion of monitors occupying the wall space increased, the space induced more aggressive, upfront, and overpowering visual stimulations. For example, Viacom International (1991) and DMB&B (1993) used Pulsate to set the tone in media and advertising agencies. The scale of the monitors in relation to the

[40] Monica Geran, “Executive Privilege,” *Interior Design* 58 (1987): 197.

wall sought an optimal composition; a visually aesthetic way to interrupt a long elevation or corridor with changing graphics. (See Figure 2.4.9) For Viacom International, a large broadcasting company housing many different channels, Pulsate also served to distinguish between different networks, e.g., the floor was dedicated to MTV, Nickelodeon, or VH-1.

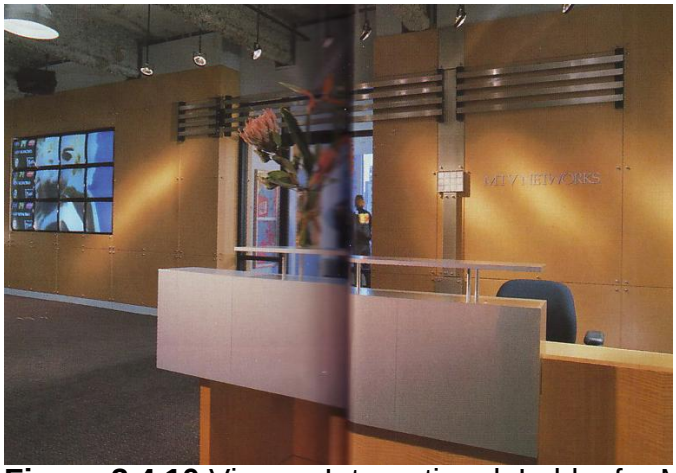

Figure 3.4.10 Viacom International, Lobby for MTV designed by KPFC (1991). Left to the reception desk, a huge screen made of twelve monitors transforms an otherwise plain wall.
PhotoCrd: Andrea Loukin, "Viacom International," *Interior Design* 62 (1991): 193.

Pulsate expanded into retail and hospitality installations during the mid 1990s. Peter Marino designed the flagship store for Donna Karan (1994) in Jeddah, Saudi Arabia. (See Figure 2.4.10) Monitors were presented as a part of display system, directly exposing buyers to audio and visual advertising. It was impossible to bypass the captivating monitors as shoppers examined merchandise on the racks below. Movement from the models in video induced a lively and upbeat atmosphere throughout the store. In 1996 DKNY store in London also employed monitors to bring 'New York City' into the space. The presence of screens is reminiscent of a billboard dominated city-scape, perhaps akin to Time Square. Against the White-Box interior, the four screens

create a vista onto the rapid paced world of fashion where trends emerge and die overnight. “Oversized video screens whose moving images of news and fashion events inject a kinetic energy to the space,”[41] while instantly branding the space as that of DKNY, which targets young generation for luxurious comfort in spirit of the city. The screen frame and spacing between monitors again appear like windowpanes and mullions. (See Figure 2.4.11)

Figure 3.4.11 Donna Karan boutique designed by Peter Marino. (1994) PhotoCrd: Monica Geran, “Peter Marino: the bi-level Donna Karan Boutique in Jeddah,” *Interior Design* 65 (1994): 138.

Figure 3.4.12 Peter Marino designed DKNY store in London. (1996) PhotoCrd: Edie Cohen, “Peter Marino for DKNY,” *Interior Design* 67 (1996): 117.

A 16-monitor screen at the Sportsystem by United Colors of Benetton designed by Phillip Janson (1994) is another example of Pulsate. It is posed as the focal point within a white box adjacent to a Showcase Stair. Contrast to pristine atmosphere of finishes – ivory paint walls, circular opening, and iron railings – the electronic field serves to set the overall tone for the energetic, dynamic, and kinetic vigor into the space. Pulsate also carries Benetton’s

[41] Edie Cohen, “Peter Marino for DKNY,” *Interior Design* 67, no. 5 (Apr. 1996): 117.

effort to unify the different types of sports specialties under one corporate brand. Eleven manufacturers' promotional 'video clips or a rapid scramble-effect of multiple pictures followed by the log of Benetton are featured.[42] Images of athletes constantly animate the wall plane while captivating shoppers with audio stimulation and visual motions that make hearts beat faster. (See Figure 2.4.12) The monitors occupy an entire wall section from floor to ceiling, and the sheer size of Pulsate creates an electronic billboard or landmark within the interior space.

Figure 3.4.13 United Colors of Benetton Sportsystem store in New York designed by Phillips Janson Group, 1994. Left shows a clip of various types of athletes. Right shows when the screens are displaying the corporate logo of United Colors of Benetton.
PhotoCrd: Monica Geran, "Phillips Janson Group: Benetton Sportsystem Showroom, New York," *Interior Design* 65 (1994): 206.

In restaurants and bars, Pulsate has a voyeuristic quality, an idea originally pursued by Bruce Nauman's 'Corridor Installation' and Vito Acconci's CCTV art. Restaurants featuring Pulsate become a social haven for those who enjoy others' attention, and for those who enjoy people watching. Patrons become active participants, a main actor at the moment. Privacy is not a priority in

[42] Monica Geran, "Phillips Janson Group," *Interior Design* 76, no. 7, (May 1994): 206.

these spaces, but one can control visibility by bypassing the bar, where cameras and screens are usually concentrated. Nonetheless, the presence of camera instills a heightened awareness of oneself and this excitement leads to more active scene for dining and socialization.

In New York City's Seagram Building, the Brasserie restaurant, (2000) designed by Diller+Scofidio has positioned a video camera in the doorway to records patrons as they enter. Captured images of the patrons are displayed on monitors on the back wall over the bar, becoming provisional art.[43] (See Figure 2.4.13) The environment "exaggerates the exhibitionist act of seeing and being seen, heightening the awareness of both the absurdity and beauty of social rituals."[44] The linearity of a row of screens echoes the stream of bottles on a display wall behind the bar; regular placement of objects creates a visual rhythm. The act of coming through the entrance is constantly broadcasted. As a whole, the screens show arbitrary orchestration of similar motions happening at different rates. Movement is emphasized and interpreted in many ways in the Brasserie – nothing in the interior will physically move, but animated elements that suggest constant movement will keep patrons visually engaged.

[43] Aaron Betsky, "Diller+Scofidio," *Architecture* 89, no. 6 (Jun. 2000): 142.
[44] Aaron Betsky, *Architecture* 89 (2000): 142.

Figure 3.4.14 The Brasserie at Seagram Building in New York designed by Diller+Scofidio. (2000) Left shows detailed view of monitors from the bar. Right shows how the row of screens is suspended from the ceiling on the backdrop of bottle display.
PhotoCrd: Diller+Scofidio +Renfro, "The Brasserie," http://www.dillerscofidio.com/brasserie.html (Accessed Nov. 23, 2009)

The Remote Lounge in Manhattan designed by Jordan Parnass, (2002) was a technophile's version of a lounge. Pulsate replaced the usual social ritual happening at the metropolitan social scene, through more than 60 video cameras that recorded live view of the space. Some of the cameras were fixed onto the ceiling like pendant lightings along the bar. Rows of screens above the bar broadcasted happenings inside.[45] Faces and bodies are echoed through the monitors –seen in person and also through live videos, which doubles the visual stimulation. There are also individual computer stations with telephones where customers can change the channels to see different camera views and phone those congregating at the main stage or send text messages that would appear in the 'LED tickers' at the bar. (See Figure 2.4.14 through 2.4.16) Although the lounge closed in 2008, flashes of screens along with electronic music from avant-garde DJs records Remote Lounge as a unique cyber venue.

[45] Linas Alsenas, "On Candid Camera," *Interior Design* 73 (2002): 62.

Figure 3.4.15 Remote Lounge design by Jordan Parnass in New York, 2002. Left shows bar scene. Note suspended cameras and two rows of monitors.
Figure 3.4.16 Top right shows individual monitor and phone station. The large screen on the right displays images of patron at random.
Figure 3.4.17 Botttom right is a view from monitors showing patrons.
PhotoCrd: Linas Alsenas, “On Candid Camera,” *Interior Design* 73 (Jun. 2002): 62.

A large scale installation of Pulsate overpowers the viewer, like facing a billboard upfront. When designing Morimoto in Philadelphia (2002), designer Karim Rashid chose to work with an unconventionally long space of 21 feet by 240 feet plan because “it forces creativity.” As an effort to push the envelope, screens spanning from floor to ceiling became a dramatic physical statement that served as an introduction to the restaurant. The electronic billboard, comprised of multiple screens, display an exaggerated video of a virtual hostess. Against the backdrop of wave patterns, the image slowly changes in harmony with the organic lines and smooth edges, the signature style of Rashid. The blue light transmitted from the monitor is bounced off from the

polished wood ceiling and floor, creating a changing colored volume like Chameleon. Pulsate in Morimoto assertively defines the identity of the hip Japanese fusion restaurant headed by the celebrated chef Morimoto.

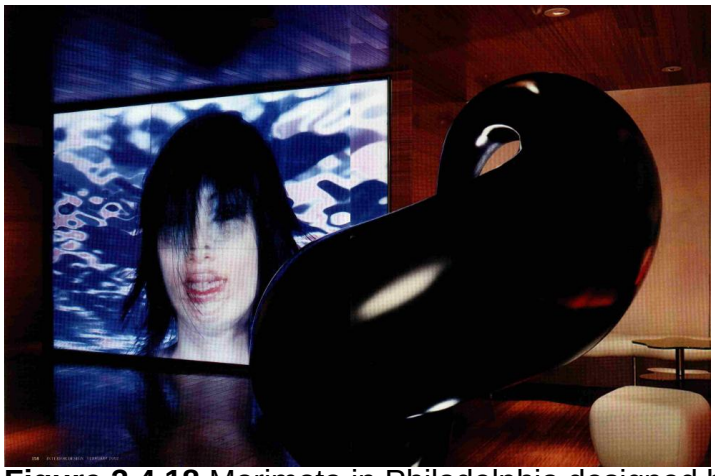

Figure 3.4.18 Morimoto in Philadelphia designed by Karim Rashid, 2002. PhotoCrd: Craig Kellogg, “Chef’s Choice,” *Interior Design* 73 (Feb. 2002): 158.

For his luxury brand clients, Peter Marino Architect steadily utilizes Pulsate in retail environments to maximize the promotional aspect while adding theatrical flamboyance. In 2008 Paris, the seventeenth century French Mansion was renovated into a Christian Dior Boutique. In accordance with the exaggerated spirit of John Galliano, the legendary designer at Dior, a plasma screen showing video art by Oyoram filled window openings as a backdrop for the merchandise. These openings ringed the upper reaches of the double height entry rotunda, creating a large enclosed, even overpowering experience of Pulsate. (See Figure 2.4.18) Screens placed within the framed voids became a successful strategy for historical adaptation. The rotunda connects to individual rooms that house different types of Dior merchandise. Pulsate was used in the connecting passage to emulate fashion runway motions. The larger than life size figures strut towards shoppers facing the screens. The

space is expanded beyond the physical wall, thus transporting a customer into another time and space. The architect claims, 'as a shopper, you are part of the scene.'[46] The result is a powerful presence of the brand Dior created by the juxtaposition of the classic architectural elements with futuristic technology.

Figure 3.4.19 Dior boutique in Paris designed by Peter Marino (2008). Screens fill the upper half window spaces of rotunda. Below are built in shelves for product display.
PhotoCrd: Mallery Roberts Morgan, “Dior, J’Adore,” *Interior Design* 79 (Feb. 2008): 167.

Pulsate testifies the diverging role of interior space today – an envelope through which images are transmitted. The active quality of monitor as an object infused kinetic energy into the space and ensnared the occupants. Pulsate adds complexity through the play of visualization and voyeurism, energy and transformation. Since the late 1980s, Pulsate has provided an infinite possibility of how interior spaces can look, sound and feel.[47]

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[46] Wallpaper Magazine, “Christian Dior: Retail Directory 2007” http://www.wallpaper.com/directory/398 (Accessed 4/ 17/ 2010)

[47] Evidence for the archetypical use and the chronological sequence of Pulsate

in Transformative Interior was developed from the following sources: **1980** Living Room, Lewis Wolff Residence [1983] P. Paul; Los Angeles, CA in Monica Geran, “Executive Privilege: A Very Personal and Atypical Office Designed by Penni Paul, ASID for a Los Angeles Developer,” *Interior Design* 54 no. 4 (April 1983): 188; PhotoCrd: Toshi Yoshimi; Anonymous Pivate Office [1987] Ellen L. McCluskey Associate; New York, NY in Monica Geran, “Executive Privelege: the Private Offices of a Company President Designed to his specifications by Ellen L. McCluskey Associates,” *Interior Design* 58 no. 8 (Aug. 1987):197; PhotoCrd: Phillip H. Ennis; **1990** Viacom International [1991] Kohn, Pederson, Fox, Conway Associates; New York, NY in Andrea Loukin, “Viacom International,” *Interior Design* 62 no. 9 (Sep. 1991):193; PhotoCrd: PHOTOGRAPHER; Headquarters for D’Arcy Masius Benton & Bowles [1993]; Gwathmey Siegel Architects; New York, NY in Edie Cohen, “Three Advertising Agencies by Gwathmey Siegel,” *Interior Design* 64 no.1 (Jan. 1993): 89; PhotoCrd: Paul Warchol; Benetton Sports System Store [1994] Phillips Janson Group; New York, NY in Monica Geran, “Phillips Janson Group: Benetton Sportsystem Showroom, New York,” *Interior Design* 65 no.6 (May 1994): 206; PhotoCrd: Anonymous; Donna Karan Botique [1994] Peter Marino; Jeddah, Saudi Arabia in Monica German, “Peter Marino: The bi-level Donna Karan boutique in Jeddah dramatizes the duality of the fashion designer’s casual and dress-up collections for Saudi Women,” *Interior Desig*n 65, no.11 (Sep. 1994): 143; PhotoCrd: Esto Photos/ Peter Aaron; DKNY [1996] Peter Marino; London, UK in Edie Cohen, “Peter Marino for DKNY,” *Interior Design* 67, no. 5 (Apr. 1996): 119; PhotoCrd: Chris Gascoigne; TV garden at Samsung HQ [1998] The Burdick Group; Seoul, Korea in Mayer Rus, “1998 Cultureal Diary,” *Interior Design* 69 no. 15 (Dec. 1998):139; PhotoCrd: Chung-eui Lim; **2000** Brasserie [2000] Diller Scofidio; New York, NY in Aaron Betsky, “Diller+Scofidio: Under Surveilance,” *Architecture* 89 no. 6 (Jun. 2000): 142; PhotoCrd: Michael Moran; Video and Film Exhibition [Aug. 2000] LOT/EK, Architect; Palm Beach, FL in “The Screening Room,” *Interior Design* 71, no. 10 (Aug. 2000): 191; PhotoCrd: Paul Warchol; Kosushi Bar [2000] Arthur de Mattos Casas; Sao-Paulo, Brazil in Monica Geran, "Sushi e Sake," *Interior Design* 71, no. 8 (Jun. 2000):167; PhotoCrd: Tuca Reines; Morimoto [2002] Karim Rashid; Philadelphia, PA in Craig Kellogg, “Chef’s Choice,” *Interior Design* 73 no. 2 (Feb. 2002): 158; PhotoCrd: David Joseph; Remote Lounge [2002] Jordan Parnass Digital Architecture; New York, NY in Linas Alsenas, “On Candid Camera,” *Interior Design* 73 no. 6 (Jun. 2002): 62; PhotoCrd: Jordan Parnass; Electronic Arts [2004] HLW; Los Angeles, CA in Edie Cohen, “Play by Play,” *Interior Design* 75 no. 12 (Oct. 2004): 298; PhotoCrd: Fotoworks / Benny Chan; Jay Monahan Center for Gastrointestinal Health at New York - Presbyterian Hospital / Weill Cornell [2005] Guenther 5 Architects; New York, NY in Marisa Bartolucci, "Building on the Past," Interior Design (Feb. 2005): 127, 129, 130; PhotoCrd: Anonymous; 3M Office [2007] Obscura; Saint Pual in Alastair Gordon, “What a Long, Strange Trip It’s Been,” *Interior Design*

78 no. 3 (Mar. 2007): 360; PhotoCrd: Sparks Exhibits & Environments Corp; Christian Dior Boutique [2008] Peter Marino Architects; Paris, France in Mallery Roberts Morgan, “Dior, J’Adore,” *Interior Design* 79 no. 2 (Feb. 2008): 360; PhotoCrd: Jimmy Cohrssen; Steelcase Showroom and Office [2008] Chicago, IL; PhotoCrd: Jan Jennings, Intypes Project; Evidence for the use and the chronological sequence of Pulsate as a Transformative Interior archetype was also developed from site visits conducted by the researcher, Elizabeth Erin Lee, in the 2007-2010 period: New York City- Benetton Sports Store.

1980s

Title | **Anonymous Pivate Office**
Credit | Phillip H. Ennis

Anonymous Pivate Office [1987] New York, NY
Design | Ellen L. McCluskey Assoc.

Copyright Citation |
Anonymous Pivate Office [1987] Ellen L. McCluskey Associate; New York, NY in Monica Geran, “Executive Privelege,” *Interior Design* 58 no. 8 (Aug. 1987):197; PhotoCrd: Phillip H. Ennis

1990s

Title | **Viacom International**
Credit | Elliot Kaufman

Viacom International [1991] New York
Design | Kohn, Pederson, Fox

Copyright Citation |
Viacom International [1991] Kohn, Pederson, Fox, Conway Associates; New York, NY in Andrea Loukin, “Viacom International,” *Interior Design* 62 no. 9 (Sep. 1991):194; PhotoCrd: Elliot Kaufman

1990s

Title | **Headquarters for D’Arcy Masius Benton & Bowles**
Credit | Gwathmey Siegel Architects

Headquarters for D’Arcy Masius Benton & Bowles [1993] New York, NY
Design | Gwathmey Siegel Architects

Copyright Citation |
D’Arcy Masius Benton & Bowles [1993]; Gwathmey Siegel Architects; New York, NY in Edie Cohen, “Three Advertising Agencies by Gwathmey Siegel,”

Figure 3.4.20 Pulsate: Photographic Timeline

Figure 3.4.20 (continued)

Interior Design 64 no.1 (Jan. 1993): 89; PhotoCrd: Paul WarcholEdie Cohen, “Three Advertising Agencies by Gwathmey Siegel,” *Interior Design* 64 no.1 (Jan. 1993): 89; PhotoCrd: Paul Warchol

Title | **Benetton Sports System Store**
Credit | Whitney Cox

Benetton Sports System Store [1994] New York, NY
Design | Phillips Janson Group

Copyright Citation |
Benetton Sports System Store [1994] Phillips Janson Group; New York, NY in Monica Geran, “Phillips Janson Group: Benetton Sportsystem Showroom, New York,” *Interior Design* 65 no.6 (May 1994): 206; PhotoCrd: Whitney Cox

Title | **Donna Karan Boutique**
Credit | Peter Aaron/ ESTO

Donna Karan Boutique [1994] Jeddah, Saudi Arabia
Design | Peter Marino

Copyright Citation |
Donna Karan Boutique [1994] Peter Marino; Jeddah, Saudi Arabia in Monica Geran, “Peter Marino : the Bi-level Donna Karan Boutique in Jeddah Dramatizes the Duality of the Fashion

Figure 3.4.20 (continued)

Designer's Casual and Dress-up Collections for Saudi Women," *Interior Design* 65, no. 11 (Sep. 1994): 143; PhotoCrd: Peter Aaron/ ESTO

1990S

Title | **Point After Dance Club at Carnical Cruise Line**
Credit | NA

Point After Dance Club at Carnical Cruise Line [1996]
Design | Joe Farcus

Copyright Citation |
Point After Dance Club at Carnical Cruise Line [1996] Joe Farcus in Robert S. Simpson, *Lighting Control – Technology and Applications*, (Oxford, UK: Robert S. Simpson, 2003), 171; PhotoCrd: NA

1990S

Title | **DKNY**
Credit | Chris Gascoigne

DKNY [1998] Peter Marino Architect; London, UK
Design | Banks Eakin Architects

Copyright Citation |
KNY [1998] Peter Marino Architect; London, UK in Edie Cohen, "Peter Marino for DKNY," *Interior Design* 6 no. 5 (Apr. 1998):119; PhotoCrd: Chris Gascoigne

Figure 3.4.20 (continued)

2000s

Title | **Brasserie restaurant, Seagram Building**
Credit | Diller and Scofidiio

Brasserie restaurant, Seagram Building [2000] New York, NY
Design | Diller and Scofidiio

Copyright Citation |
Brasserie restaurant, Seagram Building [2000] Diller and Scofidiio; New York, NY in http://www.dillerscofidio.com; PhotoCrd: Diller +Scofidio Architects

2000s

Title | **Remote Lounge**
Credit | Jordan Parnass

Remote Lounge [2002] New York, NY
Design | Jordan Parnass Digital Architecture

Copyright Citation |
Remote Lounge [2002] Jordan Parnass Digital Architecture; New York, NY in Lisa Alsenas, “On Candid Camera,” *Interior Design* 73, no. 6 (Jun. 2002): 62, plate 1; PhotoCrd: Jordan Parnass

2000s

Title | **Morimoto**
Credit | David Joseph

Morimoto [2002] Philadelphi, Pennsylvania
Design | Karim Rashid

Copyright Citation |
Morimoto [2002] Karim Rashid; Philadelphi, Pennsylvania in Craig Kellogg, “Chef’s Choice,” Interior Design 73, no.2 (Feb. 2002): 158-159; PhotoCrd: David Joseph

Figure 3.4.20 (continued)

2000s

Title | **Christian Dior Boutique**
Credit | Jimmy Cohrssen

Christian Dior Boutique [2008] Paris, France
Design | Peter Marino

Copyright Citation |
Christian Dior Boutique [2008] Peter Marino; Paris, France in Mailery R. Morgan, “Dior, J’Adore,” *Interior Design* 79, no. 2 (Feb. 2008): 167, plate 1,2 and 165, plate 2; PhotoCrd: Jimmy Cohrssen

CHAPTER 4 Analysis and Significance

4.1 Realizations

This thesis research resulted in the identification, naming and development of a large body of evidence about four archetypical transformative practices: Chameleon, Pivot, Pulsate and Stow. The four identified intypes logistically divided themselves into two groups based on the interior modification. Adaptations which reconfigured the existing space, such as moving a wall or revealing a hidden piece of furniture, were characterized by Pivot and Stow. Alterations which do not reshape the space but modify the way in which a viewer perceives the interior, such as incorporating animated images or colored light, were depicted by Chameleon and Pulsate. Motion was a modifier in all four intypes.

Chronological Distribution of the Transformative Interior

A content review and analysis of primary sources resulted in approximately 1,720 issues of trade journals dating from the 1930s to present day. Among the 121 occurrences, nearly two-thirds of transformations (64%) took place in the US and the majority of examples occurred in urban areas. Transformative practices appeared consistently during the past fifty years as noted by their frequency in design periodicals. The assessment of Transformative Interiors determined a significant increase in each intype continuing the trend, or doubling the occurrences of previous decades since the 1980s. Three propositions lead to this rapid growth in Transformative Interiors: the

advancement of technology, emphasis on visual aesthetics, and a social change to embrace sustainability.

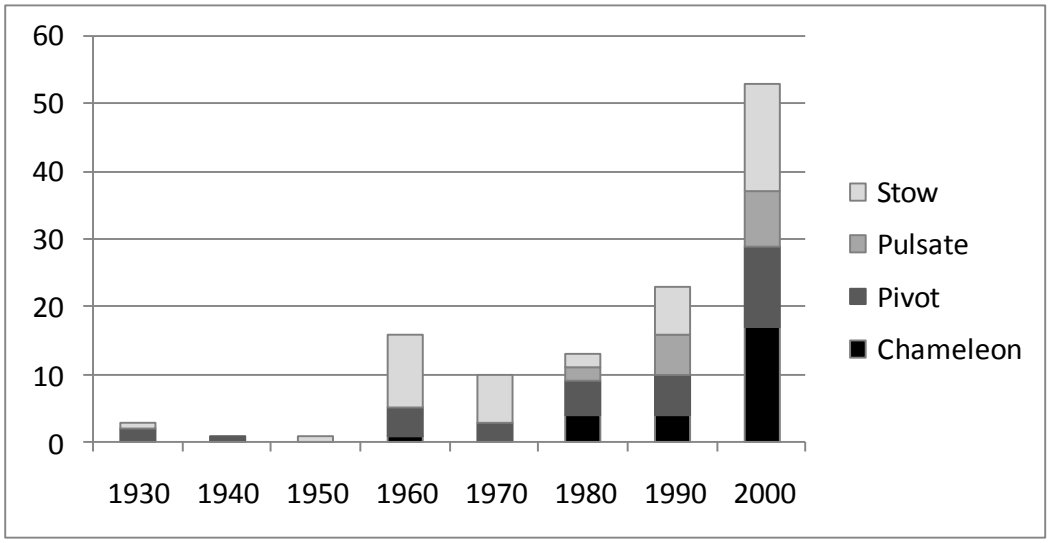

Figure 4.1.1 Graph revealing the frequency of Stow, Pivot, Chameleon, and Pulsate between the1930s to the 2000 era.

The 1980s and 1990s may be characterized as an experimental attempt in the use of Chameleon. Integrated circuits and florescent lamps with large ballasts were still expensive and cumbersome to detail in the interior. Not until electrical systems moved from analog to high speed digital signals and the discovery of full spectrum LEDs did Chameleon surge in popularity. (See Figure 4.1.1). Architects and designers embraced the multitude of burgeoning products and thereby employed smaller, cooler, more robust and energy efficient lighting systems in their design solutions. Infrared LEDs also enabled improved operation of lighting systems via remote control. Beyond the multiple technological advances that gave rise to Chameleon in the 2000s was its ability to harmonize with the movement toward sustainable practices by

offering variety within a single space over time. Aesthetic demand also pressed for more stimulation in interior. Today, animating artificial light can more efficiently produce diverse iterations of multicolored spatial drama. This ecological tactic suggests that Chameleon will remain a useful strategy to transform the interior in subsequent years.

Pulsate also materialized during the last three decades (1980s-2000s) and escalated in the last five years. The amount of cited publications nearly quadrupled during the 2000s compared to the previous two decades. (See Figure 4.1.1) This trend is the result of more efficient television and monitor technology as well as an increase in the size of monitors. Development of flatter, wider, and lighter screens using plasma and LCD technology made them more streamlined with interior planes and allowed designers to be more creative with their integration into the spatial context. Furthermore, increased precision of remote and preprogrammed controls over these technologies influenced pulsate to grow exponentially. It also led graphic designers to experiment with more artful visuals, exploiting scale, time, interactivity and audio to restaurant, retail and corporate occupants. Decreases in installations and maintenance costs of large monitors translated into a rise in visual branding for contract interiors. Internally produced promotional videos consisting of an abstract or literal images and texts are presented as a means to communicate the corporate identity. Vigorous research and development in screen and programming technology, such as acoustic pulse recognition and bidirectional LCDs, as well as an increase in guerrilla marketing and

interactive advertising suggests that Pulsate will continue to be a design strategy used in interior spaces throughout the next decade.

Pivot witnessed a longer duration than Chameleon and Pulsate having maintained a consistent presence in interior spaces for five continuous decades (1960s-2000s). (See Figure 4.1.1) Usage was steady between the 1960s through the 1990s but rapidly escalated during the most recent decade. Among the four transformative intypes, architects and designers have been exposed to Pivot for the longest time. Its mechanism was present in the evolution of furniture and interior spaces since 2000 B.C. Progress and diversification of turning mechanisms resulted in the classification of four different types of Pivot based on apparatus and procedure of rotation. According to this study, Pivoting Casework and Buildings were novel innovations that made limited and sporadic appearances during the defined time period (See Figure 4.1.2). Also demonstrating an idiosyncratic composition, Horizontal Planes saw an organized rise and fall in the interior after its climax in the 1980s. Pivoting Vertical Planes, however, has showed a sharp and recent growth (13 occurrences) during the past twenty years. The exact reason for the sizable and recent expansion of Pivoting Plan in trade publications is unknown, however several propositions are offered.

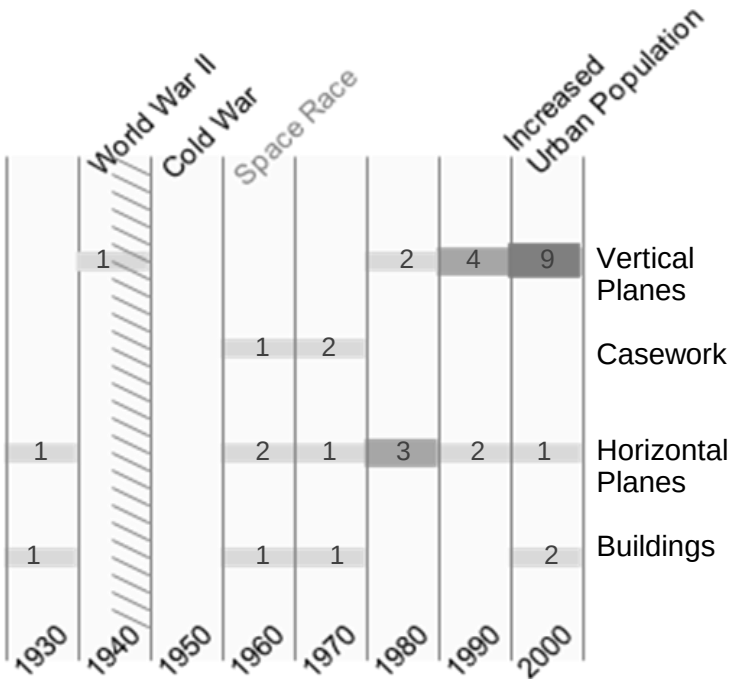

Figure 4.1.2 Graph of Frequency of four types of Pivot; (1) Vertical Planes (2) Casework (3) Horizontal Planes (4) Building from 1930s to 2000s. The frequency of publication for each motion is labeled per decade.

First, architects and designers sought solutions to practical concerns such as privacy and division of functions within limited amount of space due to increasing population in urban areas. Enhancing square footage functionality while reducing area demarcated solely for circulation made interior spaces for efficient. Second, the surge in 2000s reflects minimalist and streamlined affinity by architect, designer and consumers to an open volume of space as achieved with pivoting vertical planes. The pivot hinge is completely concealed within the panels making the transformation as unobtrusive as possible. A strong continuation of this trend with Pivot is anticipated based on the results from this study and a continued demand for highly functional and minimal aesthetic interiors.

Compared to the Vertical Planes, Casework and Horizontal Planes show a distinct beginning and end of the practice. Pivoting Casework employed unique and experimental apparatuses to maximize limited space within the residential interior. The effort ceased in the 1970s due to the complexity and impracticality of designing pivoting casework around electricity, water, and gas requirements. Hardware featured in Pivoting Casework was devised of wheels, springs, and metal pins that became worn with constant movement and thus required a high level of maintenance. The effort ceased upon the decline of public interest in maximizing living space due to the expansion of home size coupled with declining family size. Although creative utilization strategies remain in demand, more effective storage design has satisfied the niche for Pivoting Casework. Horizontal Planes were well represented by the global popularity of revolving restaurants during 1960s through 1990s. However, in the 2000s interest in revolving restaurants declined due to more relevant and extravagant themed restaurant experiences in place of the natural scenery. For many revolving restaurants, the rotation stopped when the revenue no longer covered the powering of the turntable. Horizontal planes are expected to remain as a novelty practice in other practice types such as residential and higher education, however this study suggests that wide enthusiasm for revolving restaurant is unlikely to return in the near future.

Overall, Pivot will continue into the next decade prominently through Vertical Planes. The basic working of pivot hinge has remained consistent and demand for better use of space will continue to rise, resulting in easier manipulation of planes that serves to provide effective division, egress, and

more floor space in interior thereby reducing the ecological costs implicated with occupying large spaces.

Stow was present in the past six decades; however there was a sizable drop in the 1980s and then a significant increase in the 2000s. (See Figure 4.1.1) During 1960s and 1970s, Stow was published as an alternative way of living, a new paradigm of thinking about interior spaces and furniture. Fold, push pull, and various combinations of these motions were showcased. During 1980s, there was a significant drop in publication of Stow, which may be due to a decrease in public interest. As ecological awareness and conservation became pressing issues, defying conventional room schemes and the seeking of alternative life modes became a challenge to architects and designers. Combined with an interest in sustainability Stow became regenerated as a design tactic for early adapters of downsized homes. In 1990s, Stow emerged in more sophisticated and streamlined fashion for dealing with multiuse spaces. The rising demand of obtaining a visually uncluttered space triggered the resurgence of Stow. A plethora of design literatures, such as *Living Large in Small Spaces* by Marisa Bartolucci, advocated effective space usage and promoted the multifunctional interior. In the 2000s, continuing global migration of rural populations into urban areas, especially in China and other emerging market countries, resulted in a competitive real estate market with less available space per person. Ongoing commitment to environmentally conscious living, an educated life style making choices that minimize the negative implications of the modern day living, and rising real estate costs stimulated Stow as a design strategy in high-priced and densely populated

areas. This study suggests that based on a continuous rise of concentrated populations in urban area, especially in developing countries such as China and India, Stow will increase in popularity into the next decade. Thus, while publications for this project have been mostly from the U.S. future uses for Stow might prove to be more active in Asia and rapidly growing economies.

The closer examination of occurrences of the subcategories of Stow revealed that fold motion dictated the ebb and flow of the intype. (See Figure 4.1.2) As the American baby boomers entered their teen years (1960-1980), families needed creative ways to achieve greater spatial demands. The prominent rise of Fold in design publications during those two decades (16 occurrences) suggests this was a useful strategy to maximize spatial household requirements for those in limited dwellings.

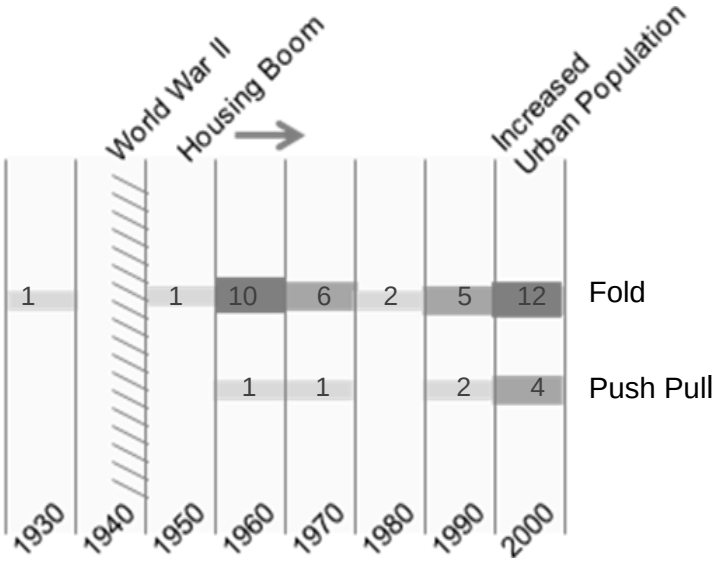

Figure 4.1.3 Graph of Frequency of Fold motion and Push Pull motion from 1850s to 2000s. The frequency of each motion is labeled per decade.

Review of the primary source information detected that Fold diminished during the 1980s—a time when home size in the United States was on the increase and family size was on the decline. Fold begins to rise again in the 1990s and spikes in the following decade. This escalation may be motivated by the parents of baby boomers, who were moving into smaller residences but desiring the same functionality and spaciousness as their previous home. With a trend toward sustainability, empty nester baby boomers and their children, known as “echo boomers,” may continue to utilize Fold as a tactic in this next decade to maintain domestic quality while minimizing construction and maintenance costs.

Evidence of Transformative Interiors by Industry Type

Further assessment of the frequency of Transformative Interiors provided information about where transformations materialized. Investigation of primary source information led to an understanding of transformation according to industry type. (See Table 4.1.1)

Table 4.1.1 Frequency of Transformative Intypes organized by Practice Types.

	Stow		Pivot				Chameleon	Pulsate	Total
	Fold	Push Pull	Vertical Planes	Casework	Horizontal Planes	Buildings			
Residential	23	8	5	3	-	5	2	1	47
Hospitality	6	-	-	-	-	1	4	-	11
Restaurant	1	-	-	-	7	-	7	4	19
Retail	2	-	1	-	-	-	3	4	10
Corporate	2	-	8	-	-	-	5	5	20
Higher Ed	-	-	-	-	2	-	-	-	2
Preservation	-	-	-	-	-	-	1	-	1
Exhibition	1	1	3	-	-	-	-	1	6
Healthcare	-	-	-	-	-	-	1	1	2
Transportation	-	-	-	-	-	-	3	-	3
Total	35	9	17	3	9	6	26	16	

The fold motion, within Stow, and Chameleon were the most popular transformative methods to occur during the period of this study. With thirty-five occurrences, the fold motion appeared to be the most accessible form of transformation for several reasons. The simple counter balance mechanism popularized in residential furniture, served as an inspiration for its usefulness in the interior. Using readily available hardware, the fold motion was relatively easy and inexpensive to install and the manual motion required for operation was intuitive; these factors offered ample usage in the residential interior. The popularity of fold was less evident in contract interiors where less than one-third of the incidences were found. Compared to residential environments, Stow in commercial interiors has been used most exclusively in hospitality as a space saving technique, such as Murphy beds. Few examples were novelty elements, or art objects intended to draw interests from the public, and in case of retail to increase sales. However the functional effectiveness of Stow in

commercial interiors was less successful due to the priority in framing Stow as a point of attraction rather than customized solution for limited space.

Chameleon, with twenty-six occurrences, showed the most diverse and numerous applications among all interior practice types. Evidence of Chameleon found its greatest popularity in restaurants, corporate headquarters, hospitality, retail and transportation interiors. One of the goals of contract designers and their clients is to create a dramatic scene with the intent of captivating patrons. Compared with other means of interior alteration, changing color lighting was a cost-effective technique to make the space repeatedly appear anew. Programmable to create an infinite possibility of color changing cycles, Chameleon became a tactic to make a static interior space become lively with hues. Since the discovery of LED lamps, their small size and low maintenance cost offered designers a more creative and artistic means to fashion an interior, even an exceptionally spacious space like an airport terminal or a corporate atrium.

Of all the practice types, transformations occurred most in residential interiors with forty-seven incidences. Compared to other practice types, requirements for domestic interior is highly customized and tailored to owner preference. More experimental design solutions can be applied to generate multifunctional space. Transformation in residential was predominantly realized through Stow for its higher usability and easier installation. Least used in residential design was Chameleon and Pulsate. Both are visually bold interventions to the interior,

typically communicating advertising and branding messages. Because residential environments are places of recuperation and stability, the degree of stimulation offered by Chameleon and Pulsate may not be desirable for highly preferred tranquil and private spaces.

Corporate interior design and restaurants had the second highest usage of transformative intypes with twenty and nineteen incidences respectfully. This study found that workplace interiors and restaurants, unlike residential where Fold alone dominated, had greater breadth and more equally utilized three of the four intypes.

Primary source information revealed that within the corporate interior, lobbies and conference rooms were the most likely location for a transformation practice to occur. One of the purposes of the corporate lobby is to convey the company's brand values and presence, e.g., serving as a storefront window. Impressions made through the lobby design consistently reinforce the image among visitors and employees, making it the perfect marketing tool for the marking of transactional space between street and workplace. The digital and light components of Chameleon and Pulsate were both widely observed in lobby space as was space saving technique of Pivot. Conference rooms benefited the most from swiveling vertical planes that completely dissolve in elevation. This allows the simultaneous exit and entrance of a large number of people, while reducing circulation space.

Transformative practice in restaurants is primarily utilized for the purpose of creating a spectacle within the interior. Pivoting Horizontal Planes, Chameleon, and Pulsate have catered to the demand of entertainment and enhanced social interactions beyond food service. Transformation as novelty attracts more customers and prolongs their stay in the restaurant, which directly affects the revenue. Restaurant is the only interior space where all five senses – sight, hearing, taste, smell, and touch- are stimulated. Designers featured Chameleon and Pulsate to create an imaginative and memorable experience for the dining consumer.

A minuscule quantity of transformative practice was found in Preservation (1), Higher Ed (2), Healthcare (2) and Transportation (3). The mission of preservation is to restore and protect historical structures, details and decorations retaining the character of the original state. Thus, the purpose of the preservation interior is the antithesis to that of transformative interior, especially the type which calls for an alteration of space. Qualities of visual stimulation, storage, and novelty experience, which characterize Transformative Interiors, do not widely reinforce the environmental qualities espoused in higher education and healthcare. This was born out in the findings of this study.

Use of transformative intypes in transportation interiors were discovered in only a few primary sources. However, the number of new airports in publication was small and thus quantity alone is not a valid assessment in this

case. A large volume of space typically unattainable by other industries posed as an engineering and financial challenge for a successful transformation to occur. Chameleon was solely used to render a dramatic experiential effect for passengers using colored light and sound to comprehensively obscure the cavernous space of an airport interior..

Based on the data of frequency examined by industry types, a pattern of occurrences is suggested for the future. Residential (47), the corporate sector (20) and restaurant (19) practice types will continue to most fully utilize transformative design strategies, whereas higher education and healthcare will remain small users of Pivot, Stow, Pulsate and Chameleon.

4.2 Assessment of Research

To adequately gather documentation of transformative interiors, multiple photographs of the same space depicting changeability were required. While trade publications may offer two or more photographs of the identical frame, it remains difficult to fully capture the constantly changing visuals through still shots alone. The greatest challenge occurred when trying to discern the transformative quality from a single static interior photograph. When images lacked the evidences of transformation, accompanying text or a more expanded periodical search, visitation or interview was required to verify and assess the qualities of the transformation.

Because transformative interiors often involved specific mechanical hardware or electrical technologies, further research was required to categorize the images. Many trade sources focused on describing the visual and emotional impact on the space but often lacked a substantial report on the engineering attributes of the project. Guided search on mechanical history, construction engineering, and hardware development enlightened the researcher to fully understand the implications of Stow, Pivot, Chameleon and Pulsate.

During the process of gathering information, several examples demonstrated a responsive and interactive quality of transformative interiors. For example, a motion sensitive surface created an interactive plane which allowed participants to create abstract graphics through the use of their fingertips. This technology is quite new and I could not establish duration to exceed one

decade. I expect additional research that centers on the connection between participant-generated interactive interiors will be realized as more innovative digital technologies become available and more installations are published.

An Unproved Transformational Intype: Moving Partitions

Originated from15th century traditional Japanese houses, moving partitions divided an open space into two rooms or stowed a whole room depending on the intention of the occupant. Modernist architects and designers advocated open space living during 1920s, and many domestic interiors adapted open plan. However demarcation of space and privacy issues demanded effective screening device that could partition off the dining room or bedroom. Various forms of partitions such as accordion walls, curtains, sliding panels, and collapsing hinged sections offered opened and closed configurations of the space. From 1920s to present moving partitions became common application. However the level of transformative quality was not comparable to other intypes presented in this thesis and thus moving partitions was discarded. Further study of the evolution and implication of moving partitions in terms of space planning and layout is recommended for the future.

Limitations of the Present Study

Because the thesis is researched and written in the U.S., the discussions in this paper are frequently bounded within the U.S. and Western European culture. This study can benefit from a more global perspective by having a

richer collection of interior examples and more comprehensive explanation behind historical developments of existing intypes. The global perspective would become increasingly important in the future as technological innovations and social trends around the globe would influence each other to a greater extent.

This study also could benefit from inclusive data on the distribution and usage of the intypes on non urban area. Most evidences came from architectural and interior design trade journals and secondary sources books pertaining to specific design issues as part of major breakthroughs or prominent projects in metropolitan cities. Thus, while the study closely follows the innovations and historical developments of the field, it is inadequate in tracking the mass adaptation of the intypes occurred in interiors. For further studies, the research on intypes can be used more effectively through a collection of public survey responses. Such data would perhaps be an indicator of which intype is more widely adapted, or if the frequency of certain intype is more accurately represented in interiors not solely published in design journals.

Conclusion

Vocabularies and concepts concerning transformation in interior design has not been studied or named before this thesis. On the basis of a typological approach, this research provides a framework to understand transformative characteristics evident in interior past, present, and future. Adding to the

Cornell Intypes Research and Teaching project, is a new group of knowledge open for dissemination and discussion among design professionals, educators, and students. Some of the transformative intypes presented in this thesis can be evaluated in terms of sustainable design practice and technological advancements.

Architectural historian Henry Sheppard Plummer suggests to inhabit a changeable environment is only natural; “since we live and work in buildings much of our lives, architecture is especially responsible for stimulating or eroding, enhancing, or repressing the human capacity to move and settle creatively with some personal initiative.” Transformative Interior intypes are archetypical practices of exercising one’s initiative, to act, to make things happen in interiors. And the motivation behind those actions follows a desire to govern one’s own life within limited environmental resources. On a personal level, discovery of unique solutions and expressions for spatial and conceptual requirements of the interior was an enlightening process. Within the context of modern history, transformative interior practice was a cross disciplinary study of anthropology and design. This thesis will contribute to a better understanding of the role of interior design in our society, and its infinite possibility to become solutions to various problems faced by humanity.

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