



# Arraying Prototypical Houses in Strip Patterns: Gregory Ain's Park Planned Homes of 1946–1949

Jin-Ho Park<sup>1</sup> · Su-Jung Ji<sup>1</sup>

Published online: 13 June 2019  
© Kim Williams Books, Turin 2019

## Abstract

Los Angeles architect Gregory Ain's series of housing projects are reviewed and analyzed with regard to the frieze groups of symmetry. Ain was very conscious of utilizing a simple reflection and translation method of arranging prototypical units along a street. He argues that although such a method is simple, it would be enough to create a variable housing layout and a diverse look. First, this article briefly introduces a formal methodology with regard to frieze symmetry in the analysis and design of housing arrangements. The concept is then applied to review a series of Ain's housing designs, which demonstrate the use of the method in his consecutive designs. Finally, the same method is applied to test possible alternative arrangements to create a dynamic streetscape. The notion of parametric designs may be applied to transform the typical unit to generate a variety of dissimilar designs.

**Keywords** Gregory Ain · Freeze symmetry · Park planned homes · Housing · Compositional possibilities

## Introduction

Typically, individual houses are arranged along a single street on each side in residential areas. They have a garden in front of the houses and backyards behind them, which can include a pergola, terrace, swimming pool, or other features. Individual houses can be built together as attached, detached, or semi-detached assemblies through a number of different processes. Houses can be arranged along the street in random ways, or multiple standard houses can be bonded together in an orderly manner such that the assembly may be conveniently specified. There is a common prejudice that such an orderly design looks boring and monotonous. This article demonstrates that even if the arrangement of the units along a street is simple,

---

✉ Jin-Ho Park  
jinhopark@inha.ac.kr

<sup>1</sup> Department of Architecture, Inha University, 100 Inha-ro, Michuhol-gu, Incheon 22212, South Korea

the final design in a town block can look complicated. A symmetry method can be playfully employed to for a multitude of different house arrangements.

Hardly any architects have methodically and consistently employed such a method in their consecutive designs. Los Angeles architect Gregory Ain stands out the most in terms of the use of frieze symmetry in arranging a standardized housing unit in a larger town scale. Ain provides some exquisite design examples. He designed and built a series of detached housing projects designed on a neighborhood scale. Although he did not clearly specify or articulate his use of the frieze symmetry as a design method, he deliberately employed the method for some standardized unit plans.<sup>1</sup>

This paper discusses the symmetry method of arraying house units in a methodical way. By multiplying identical units along a street, a variety of designs can be arrayed in different ways, and the location of all the units as a group is also specified. First, some basic information is provided about frieze groups of symmetry, which include seven different types of designs. The simplest pattern is repetitively arranged with basic units lined up in a linear pattern. Ain's housing designs are then analyzed with regard to symmetry, and finally, new possible arrangements of houses along are street are tested and constructed to illustrate compositional possibilities for diversifying streetscapes.

## Frieze Symmetry

A previous study provides a detailed description of the formal method with regard to frieze groups of subsymmetries (Park 2018), and the notion of frieze group symmetry is shortly reiterated here. A linear pattern that repeats infinitely in a horizontal direction can be classified according to its symmetry group. Such a classification is the group of all isometries that creates a pattern. The motions that leave the motif appearing unchanged are called isometries of rigid motions. There are four distance-preserving transformations of the plane: translations, rotations, reflections, and glide reflections. For rotations, any point about which a pattern may be rotated through an angle of  $360^\circ/n$  that leaves the pattern invariant is said to be a center of  $n$ -fold rotational symmetry. Patterns with symmetry have at least one of these four distance-preserving transformations that leave them invariant (March and Steadman 1974).

A frieze pattern consists of a repeated motif along a line. Frieze patterns are frequently found in architectural and decorative designs. Only seven different possible frieze groups of symmetries for such patterns are possible. The groups can be written with the notations Pmm2, Pma2, Pm11, P1m1, P1a1, P112, and P111, where P denotes a one-dimensional frieze pattern. The first letter "m" is

---

<sup>1</sup> When Gregory Ain delineated the arrangement of a unit along the street, he simply explained that he "paired and mirrored" the unit. He did not use mathematical terms, although he was familiar with them. In fact, Ain studied mathematics at the University of California, Los Angeles, between 1924 and 1926. Then he transferred to USC, where he received his bachelor's degree in architecture in 1928.

written at the first position if the group has vertical reflection. If not, 1 is written at the first position. A letter is “m” at the second position written if the group has horizontal reflection. The letter “a” is written if there is glide reflection on the axis of translation, while “1” indicates the absence of a reflection or glide reflection. Finally, either “1” or “2” is written at the end to indicate respectively the absence or presence of a half-turn (Park 2018).

Hence, Pmm2 indicates reflection perpendicular and parallel to translation and half-turn rotation. Glide reflections and half-turn rotations inevitably occur. Pma2 has a translation, half-turn rotations, and reflections along two axes. Pm11 has horizontal reflection along the translation axis, while P1m1 has vertical reflection along the translation axis. P1a1 is the only frieze group with a glide reflection and translation but no reflections. P112 has a half-turn rotation along the translation axis, and P111 has only one translation of a motif along the translation axis. A geometric description is shown in Fig. 1.

With this method, prototypical houses can be arranged as a motif into blocks of uniform lots along streets. The method functions as an organizational principle for housing arrangements. Some architects tend to employ such symmetry principles unconsciously, but only a few architects have used the method comprehensively in their designs.

## Gregory Ain's Consecutive Housing Designs Using Frieze Symmetry

Gregory Ain was born in Pittsburgh, PA, and raised in Los Angeles, CA. He became one of the leading architects in the LA area and is considered “to be listed among the architectural heroes of Los Angeles”.<sup>2</sup> He was particularly inspired by Rudolph M. Schindler after visiting Schindler's studio on Kings Road in Los Angeles. His training came mostly from his apprenticeship with Richard Neutra, Charles and Ray Eames, and the continuing influence of Schindler. According to Kaplan, Ain even “idolized Schindler”.<sup>3</sup>

Ain established his own practice in 1935, and his first commission was the Charles Edwards residence in the Los Feliz area in 1936. Most of his work at the time was residential designs. Many of his 1930s designs in particular are Schindleresque, including the Ernst House of 1937 and the Urcel Daniel House of 1939. This also includes his first housing commission, the low-cost Dunsmuir Flats apartments in 1939, which has four housing units that have two bedrooms, one and a half bathrooms, a patio, and garden. Each unit stands in a row, and the parking lot is at the ground level.

<sup>2</sup> John Blanton recalls this. See Kaplan (1988). Esther McCoy (1984) placed Ain as one of the second-generation modernist architects in California during the 1930s and 1940s, along with J. R. Davidson, Harwell Hamilton Harris, and Raphael Soriano.

<sup>3</sup> According to McCoy (1954: 12), Ain also mentioned, “[Schindler] was the first architect I had ever known, and his house was the first stimulus toward my interest in architecture”.

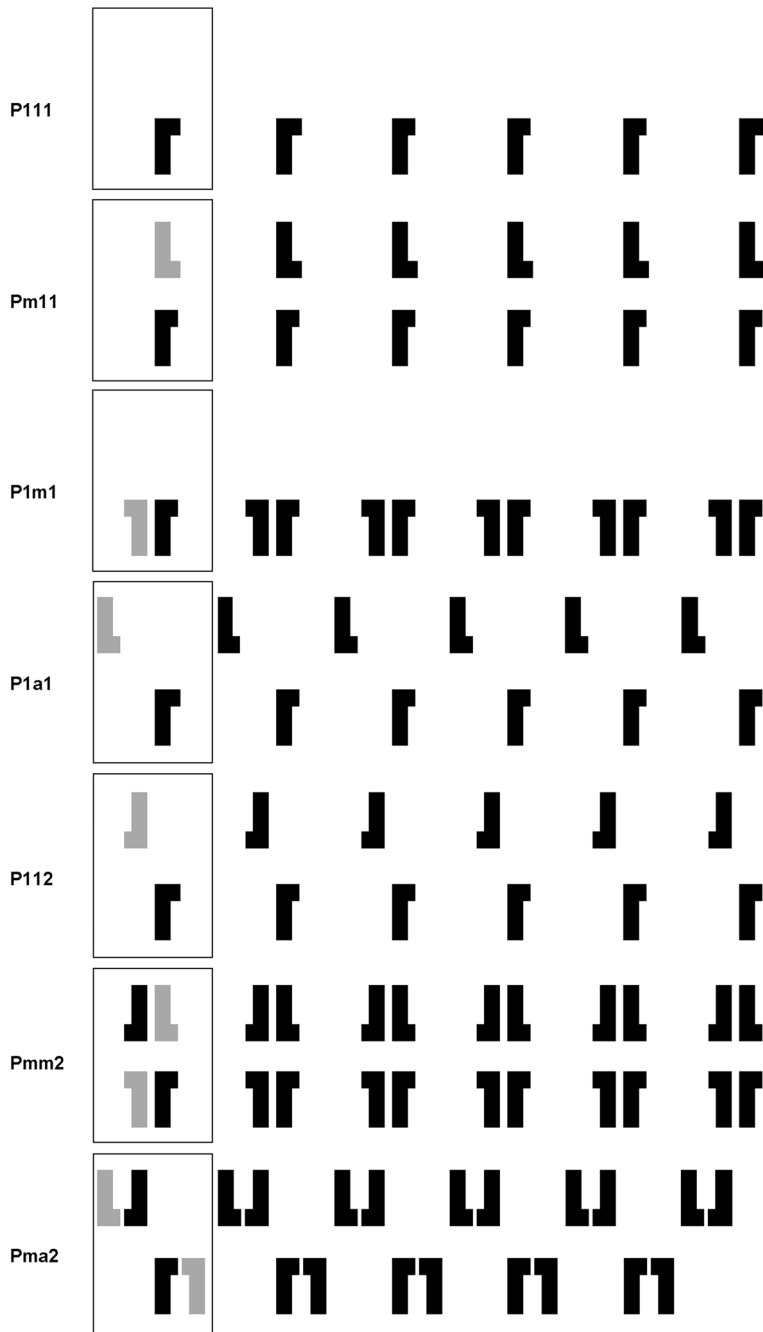


Fig. 1 Seven frieze groups of symmetry. Image: author

Ain set up an architectural office with partners Alfred Day and Joseph L. Johnson. One of the most significant contributions that Ain made during this time is a series of affordable housing projects meant for middle-class families. He developed a series of housing schemes where a simple and prototypical single-story house plan is repeatedly arranged with a communal park. Ain designed a typical housing unit, paired and mirrored the unit, and finally arranged it along the streets. This approach is simple, yet he believed that it was sufficient to create a variety of streetscapes. Ain was consistently applied the method meticulously for almost ten years of consecutive projects.

### **Preliminary Proposal "A" (1939/1940)**

Preliminary Proposal "A" was an unbuilt project planned for a low-cost community housing development in Southgate, CA. A typical unit is based on a four-room house in a 40 ft by 125 ft lot. Each unit has a 30 ft by 40 ft private garden. A common playground and park, 60 ft wide and the length of a block, is provided toward the backyard. It is made up of the combined 30 ft rear ends contributed by all individual lots, and is protected so that children could be kept off the streets. Residents on both sides of houses along the park can use as this shared communal area. It seems that Ain valued social interaction with shared green spaces, envisioning a community spirit. Similar ideas can be seen in his 1946–1949 unbuilt project for the Federal Housing Administration (FHA), the Community Homes in Reseda, San Fernando Valley (Hise 1997). In this project, Ain proposed a site plan where huge communal parks would be provided between housing lots. His shared and socially driven approach continuously appears in his affordable housing designs for middle-class families.

An entrance yard made by paired front yards is provided. Ain writes that even if the same unit is repeated continuously, it may not create a monotonous streetscape because a different treatment of exterior elements is applied. Such an approach is easy to lay out efficiently in construction, and is efficient for maintaining and repairing any building problems.<sup>4</sup>

Here, Ain envisioned for the first time that prototypical houses would be paired, reflected, and translated in each other. In the layout, he drew only six units, and the other side of the park was left open without positioning any unit. Although only half of the lot was laid out on Ain's drawing, he seems to reflect the unit house on both sides of the street both vertically and horizontally (Fig. 2).

---

<sup>4</sup> "Preliminary Proposal 'A' for a low-cost community housing development in Southgate, California," *Gregory Ain papers* (Architecture and Design Collection. Art, Design and Architecture Museum, University of California, Santa Barbara).

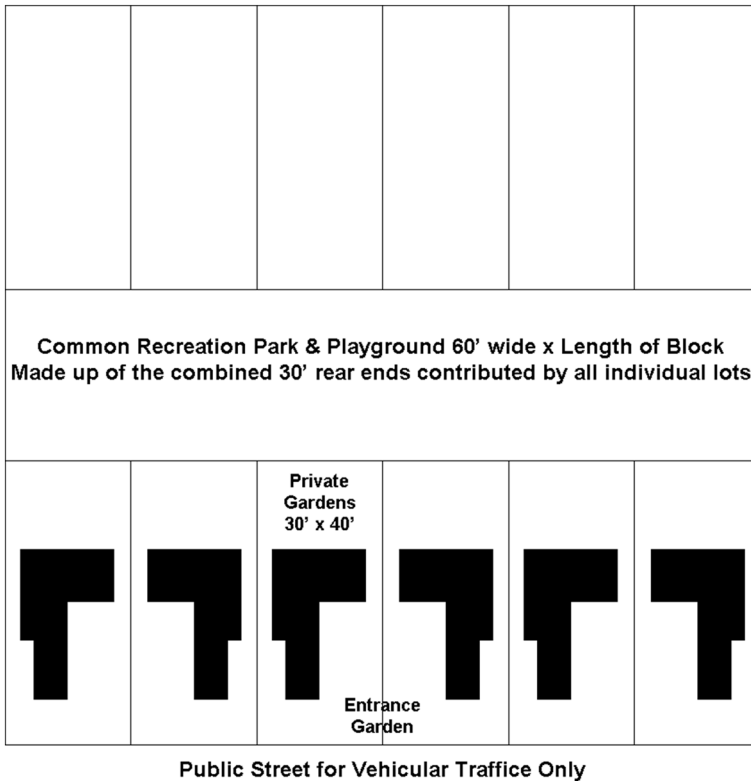
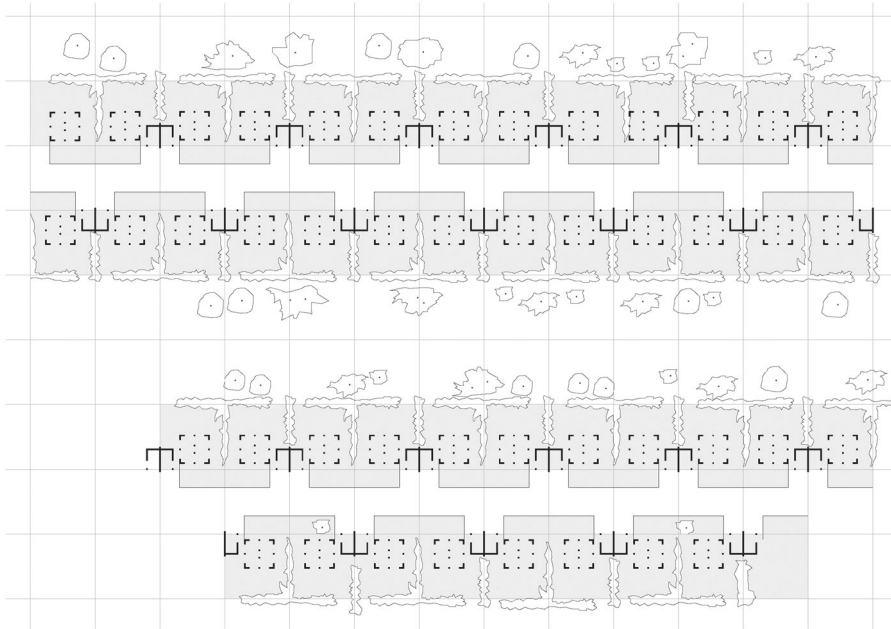


Fig. 2 A partial site plan for the Preliminary Proposal “A”. Image: author

### One-Family Defense House (1939)

The One-Family Defense House project was one of the most overt manifestations of Ain’s strong ideological attitude toward communal housing development. A standard unit consisted of a simple 20 ft by 20 ft square plan with a height of 8 ft. The units are placed 10 ft apart, and each one is made of four precast concrete slab corners, where structural posts are located in cross-axial locations. The design was so simple because it was intended for mass producing units with minimal cost. In this project, Ain also provided a communal park for residents along the park to share. Each minimum unit has its own backyard, but two units share a front yard. Garages are placed side to side.

Similar to Preliminary Proposal “A”, the front yard is shared but the backyard is divided by hedges to provide privacy for each unit. The backyard has a small entrance door to provide a pathway to the communal park. The units, garages, shared front yards, and private backyards are paired and reflected. At first sight, it looks similar to Preliminary Proposal “A” because a prototypical house is paired,



**Fig. 3** A frieze layout with a simple housing unit and garage from the One Family Defense House. Image: redrawn by Donggyun Ro

reflected, and translated. However, careful examination of the layout reveals that each house with a detached garage is alternatingly shifted and arranged (Fig. 3).

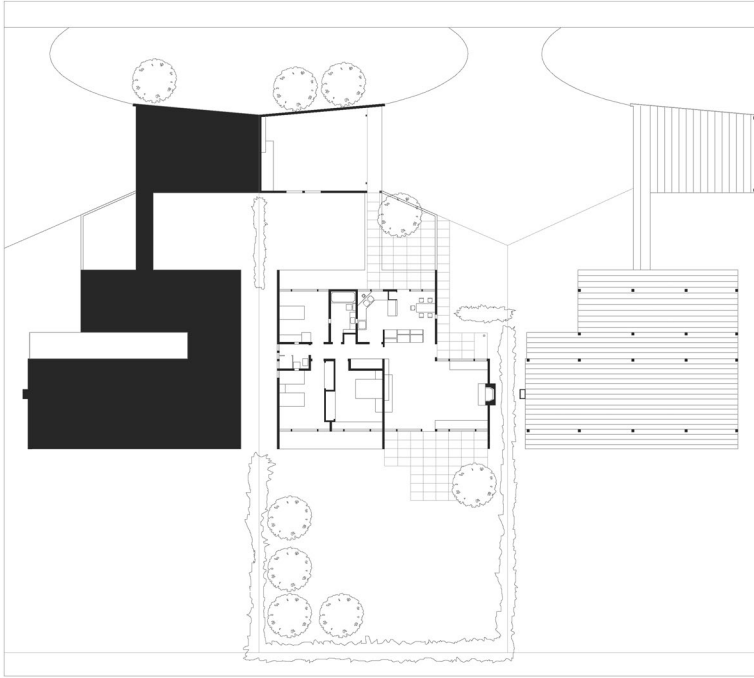
### **Park Planned Home (1946–1947)**

Ain finally realized his social and communal idea in the Park Planned Home project in Altadena, CA. From 1946, he designed and built housing communities for average families. Twenty-eight houses with typical areas of 1344 square feet are arranged on gently sloped lands along Highview Avenue between E. Altadena Drive and E. Mariposa Street.

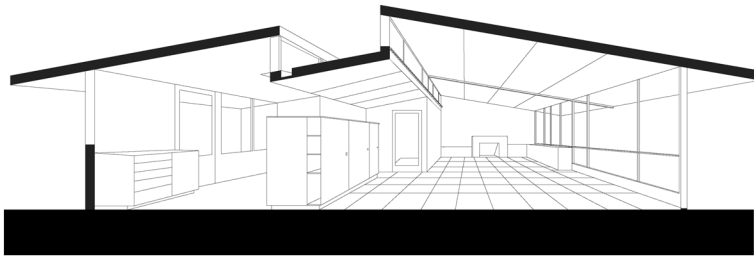
The single-story unit prototype is composed of simple rectangular rooms and has no symmetry involved in its design. It consists of three bedrooms, two baths, a kitchen, a dining area, and an L-shaped living room.<sup>5</sup> Each house lies on approximately on 1/6 of an acre on average with two outdoor patios enclosed for privacy from street and neighbors.<sup>6</sup> Once entering the house, one meets the public area including the living, dining room, and kitchen. Each unit has open and flexible floor plans and combines the living areas and adjacent dining and kitchen areas into

<sup>5</sup> The size of the L-shape measures 24 ft long, 16 and 20 ft wide. See Kahan (1947).

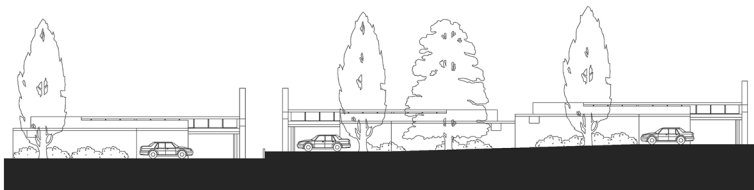
<sup>6</sup> The description appeared in Kahan (1947).



**Fig. 4** Gregory Ain, plan drawing, Park Planned Homes, 1945–1947. Image: redrawn by Donggyun Ro



**Fig. 5** Section drawing of the unit house, Park Planned Homes, 1945–1947. Image: redrawn by Donggyun Ro



**Fig. 6** Elevation of three houses, Park Planned Homes, 1945–1947. Image: redrawn by Donggyun Ro



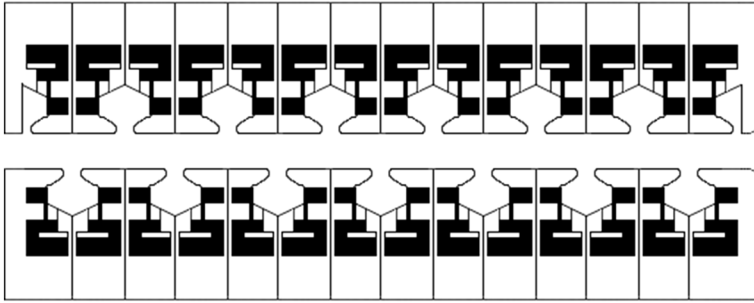


Fig. 7 Site plan, Park Planned Homes, 1945–1947. Image: author

a single gathering space where family members can interact. Such an open plan also allows for maximizing the interior space in a small residential design (Figs. 4, 5, 6).

Between the living room and dining room, instead of a solid wall a built-in closet is installed to separate the two spaces. It is shorter than the ceiling height and works as a coat closet to the entry, a closet for the dining bay, and a refrigerator slot for the kitchen. The closet serves as a low-cost wall that divides between the living and dining spaces in the open-plan living space. The public spaces are connected to three bedrooms with a corridor. Clerestory windows are provided over the corridor for natural lighting.

Two identical units with a carport are assembled side by side and mirror each other (Fig. 7). The prototypical unit is “paired and mirrored” in almost identically divided lots (although each lot size is slightly different). The carport does not visually dominate the streetscape. Shrubs between units opposite one another protect the residents’ privacy. Room walls that face neighboring lots are provided with no openings except for a small fixed window for ventilation in the bathroom. All three bedrooms are open to either the front or back yard. The living room is open to the back yard, while the dining and kitchen are open to the front yard. Each room has its own views without obstruction from the outside or neighbors. The front yard is enclosed and away from the street.

Other than the main entrance from the common front yard, another direct access with a covered canopy is provided from the carport to the dining area through the front yard. Ain provided private and public open spaces in order to offer residents a livable community. In particular, the front yard is planned to be shared so that a variety of open spaces throughout the neighborhood would be created, while also personalizing each front garden. Because the lot is sloped, Ain leveled the heights of each pair of houses and garages so that the front yard and driveways would be split with a low concrete wall across the street.

Unlike the previous work, there is no shared park in this project because the lots are subdivided and closely fitting within the existing street block. Ain adapted the paired and mirrored method first conceived in his earlier projects. Tony Denzer states, “Pairing the houses and sharing the driveways created an unbroken stretch of frontage 96 ft long for each pair in front of the garages. The resulting ‘islands’ functioned as representational front yards, although they subversively



**Fig. 8** Photograph of a pair of Park Planned Homes (photo taken by the author)

spanned property lines” (Denzer 2008: 115). The approach was derived from Ain’s early unbuilt schemes such as the One-Family Defense House of 1939–1940 and Preliminary Proposal “A” of 1939,<sup>7</sup> yet flourished in this project. Although the two earlier projects were never built, they provided a basis for further development where the compositional method is consistently applied in his consecutive designs.

Some may argue that houses repeated in unbroken arrays along the street may create a poor-quality look like a row of jerry-built houses. Such an arrangement of a standard house could also make the street view boring and monotonous, thus lacking in variety. Ain and his landscape partner Garrett Eckbo argued that such a repetitive arrangement is not noticeable from the street when trees and shrubs are fully grown and different treatments of exterior elements are applied to each house, thus allowing for diverse and variable exterior appearances.<sup>8</sup> Eckbo also sketched a variety of color schemes of houses where colors are used as options to generate a variety of looks (Fig. 8).

### **MOMA Exhibition House (1950)**

The same compositional method was applied in the exhibition house in the Museum of Modern Art (MOMA) in New York. Ain was honored with being selected to design and construct the MOMA’s second exhibition house in the museum garden,

<sup>7</sup> See also Devenney (2014).

<sup>8</sup> Ain collaborated with landscape architect Garrett Eckbo on other projects, such as Mar Vista Housing (1947–1948), Avenel Homes (1948), and Community Homes (1948). They shared a vision for the social planning of cooperative housing communities. These are excluded in the analysis of this paper because Avenel Homes is a small 10-unit cooperative housing where five units as a group is simply lined up. And each group of five units is simply located back to back. Its arrangement doesn’t belong to one of seven frieze groups. The other two housing projects, Mar Vista Housing and Community Homes, are huge blocks of housing development rather than simple strip types.

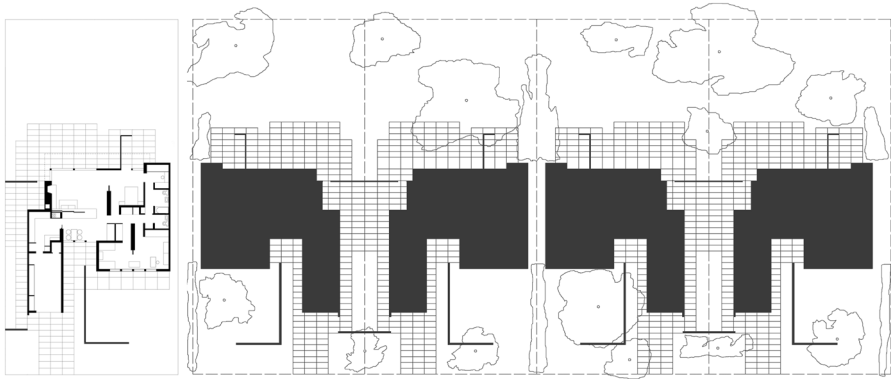


Fig. 9 Typical unit plan and its arrangements along the street. Image: author

following Marcel Breuer's project in 1949. He proposed a 1420-square-foot house, which is larger than other Ain's other houses. It has three bedrooms and two baths with a living room, kitchen, and garage.

The spatial composition of the unit floor plan is similar to his other house plans. Ain placed the kitchen and dining room to the left of the entrance hall. The kitchen is linked with the garage, and between them, there is storage to contain most of the household supplies. He utilized the maximum flexibility of the interior space between the living room and the kitchen, the living room and the master bedroom, and between the two children's bedrooms. In addition, sliding panels are used to block the visual flow between the living room and the kitchen (Denzer 2008). In the exterior, Ain used wooden fences and shrubs for each property to increase privacy and block street noise. Again, the prototypical unit is based on a 4 ft module. The unit is reflected and paired such that two identical mirrored units with carports are translated along the street (Fig. 9).<sup>9</sup>

### Compositional Possibilities of Arraying the Prototypical Unit

Ain consecutively experimented with the method as a recurring theme for housing layouts in strip patterns. He divided the lots into nearly equal portions and placed a communal park that can be shared by all individual lots. He then designed a prototypical unit house and paired, rotated, reflected, glide reflected, and translated it along the street. He used up all isometric transformations with the seven possible frieze groups of symmetries for the creation of such layouts.

Formally, Ain's approach is similar to the frieze groups of symmetry. Most of his linear arrangement belongs to the frieze groups of symmetry, particularly Pmm2

<sup>9</sup> The exhibition was held between May 17 and October 29, 1950. For the detailed information about the house, see Ain (1950).

and Pma2. For example, Preliminary Proposal “A” belongs to frieze group Pmm2, which comprises reflection perpendicular and parallel to translation, as well as half-turn rotation. The One-Family Defense House belongs to frieze group Pma2, which contains a translation and a glide reflection, half-turn rotations, and reflections along two axes. In the Park Planned Home, Ain’s employment of the frieze group symmetry was exquisite compared to his earlier projects. All of the house units with a front and backyard, garage, and access road are exactly lined up according to the symmetry principle, particularly in the frieze group of symmetry Pma2.

Although a variety of other possibilities exist, he used only two particular frieze group symmetries. Thus, it is necessary to explore a complete map of plausible house arrangements with regard to the frieze groups of symmetry. In this section, we primarily test all other frieze patterns of layouts. Then, some external elements are added to each house unit to provide a dynamic streetscape.

## Alternative Layouts

Assume that we arrange Ain’s typical house unit used in the Park Planned Home along a street. An individual lot size is approximately 48 ft wide by 150 ft deep. Then, Ain’s typical unit design is moved according to the isometric transformations to come up with all possible seven frieze layouts. The frieze patterns P111 and P1m1 are practically and architecturally impossible because the other lots opposite to one side must be left open. Accordingly, in addition to the scheme that Ain designed, only four more frieze layouts are feasible (Fig. 10).

All five frieze arrangements will be enough, but more diverse elaborations are still needed. In fact, the relevant arrangements of the units would generally be synchronous rather than asynchronous with each other. The final arrangement looks asymmetrical as well. Possibly, some other unit types may be added to characterize the neighborhood, which would vary in scale and massing, each with unique exterior elements facing the street. Lining up the diverse units into an arrangement will lead to the most complex organization of the layout.

The arranging experiments reveal that some of the lots (in the cases of Pm11, P1a1 and P112) become twice as large as the original lot. Because the initial house was built for the average household, it is realistic to enlarge the unit house in response to the lot sizes. It is also natural to enlarge or diminish the sizes of houses to accommodate the changing needs and conditions of residents. Because a sort of coherent form is desirable for the neighborhood, it is a reasonable option to add a parametric design where each room of the house is incrementally expanded. Parametric design allows us to change the sizes and shapes of various rooms according to the diversity of rules that we have applied (Park 2006). The benefit of this method is that a variety of dissimilar designs can be generated by slightly transforming rooms. Because Ain used a 4 ft grid module to govern the spatial design of the house, each room can be expanded according to the module. For example, certain rooms can be expanded in one or two directions (vertically or horizontally, or both) such that they do not lose the characteristics of the original design (Fig. 11).

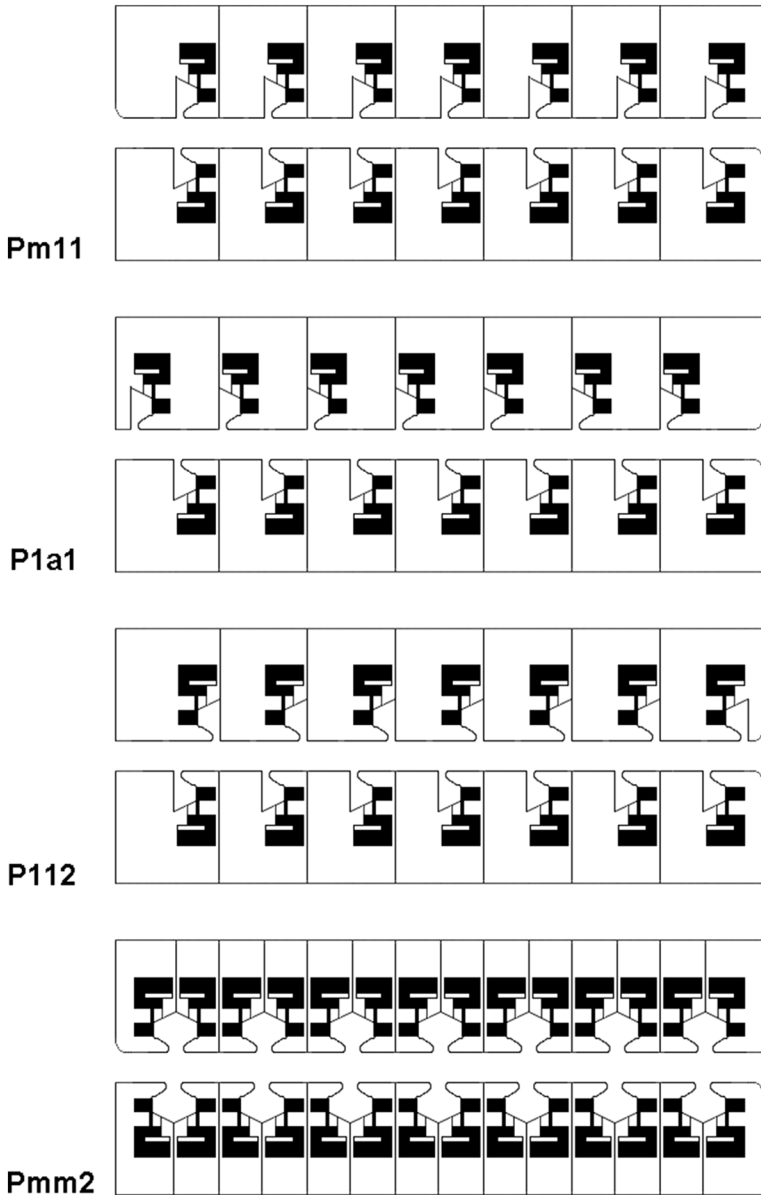
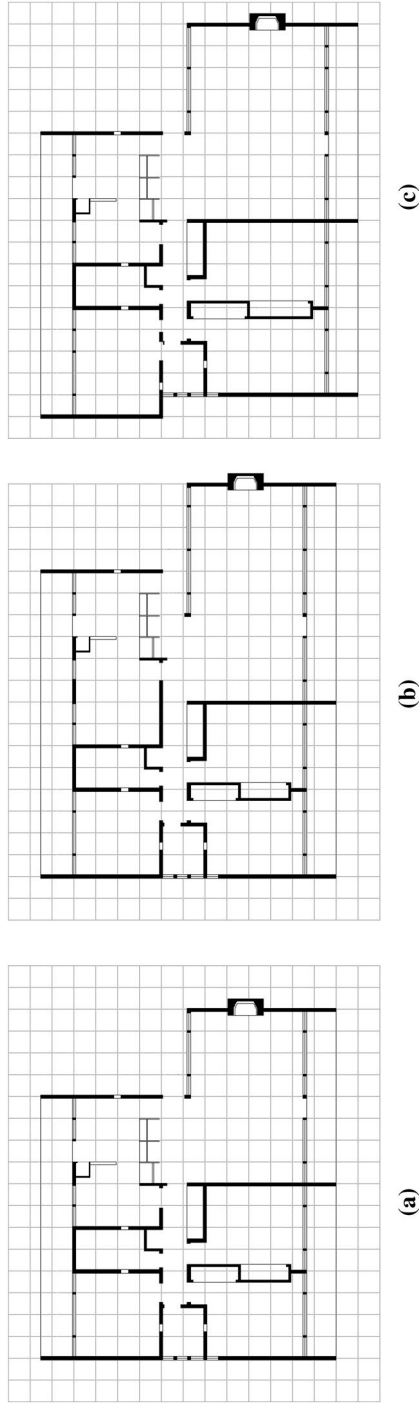


Fig. 10 Four frieze arrangements elaborating Ain's house unit

### Dynamic Streetscapes

The resulting layouts become even more interesting when other external elements are added to each house unit and landscape. In the assembly, these additions help individual bundled units to look different so that it is hard to find that each individual



**Fig. 11** Potential parametric designs of the unit plan: **a** a typical floor plan; **b** kitchen and living room are expanded two units horizontally; **c** rooms and living rooms are expanded vertically and horizontally. Image: author

house is based on the same design. Ain also thought about adding other elements to eliminate the monotonous image of the houses. Ain's landscape architect, Eckbo, experimented with different trees and building colors in each housing unit. A row of trees around the entire block at the sidewalk are added to provide visual protection, maintain privacy, and define the border of exclusive space for each lot. Above all, we may add some other elements so that diverse and variable streetscapes will be created. For example, pergolas, trellises, cantilevered entrances, decks, built-in flower boxes, external walls, or gates could be attached to each unit. In this process, the combinatorial possibilities increase dramatically. Of course, quality neighborhoods are enhanced by well-landscaped and pedestrian-oriented streets. Such a variety in the character of diverse arrangements and external elements helps to minimize the visual monotony of the neighborhoods.

Such symmetric arrangements and external additions definitely offer dynamic views of the overall block.<sup>10</sup> Eye-level street scenes of the block provide a glimpse of what the streetscape might look like to someone walking around the street (Fig. 12). At first sight, the final design appears as a complex or randomly organized design with constituent parts that are arranged in a disorderly way that is unlikely to have arisen by chance alone. The final design does not appear simple or monotonous. Despite the substantial similarities of each unit, the streetscape of each side of the street is distinctive, possessing a few common configuration properties from the pedestrian's perspective. Walking along the street, pedestrians should experience variety in the streetscape, minimizing boredom and monotony in the neighborhood. The kind of design that derives disorder from order reflects the fact that the final random look or complex design depends on regularity and predictability at the level of individual house unit.

## Conclusion

This paper has described the frieze groups of symmetry as a compositional method for housing layouts along a street. Gregory Ain offered exquisite architectural examples, demonstrating how such symmetric methods are utilized to array a simple prototypical unit on a city block. He also proved that the housing block can illustrate a variety of streetscapes along the street.

Although unbuilt, his earlier projects such as Preliminary Proposal "A" and One-Family Defense House offered very striking pieces of evidence that there exists a primary logic and method to his subsequent developments. His theme of arraying a prototypical unit along the street was recurrent in his later designs. In particular, Park Planned Home embodies the way that Ain epitomized the peak of his approach and a synthesis of his beliefs about the method.

---

<sup>10</sup> Park (2004) demonstrates systematical experimentation with symmetric transformations to generate design variations. The symmetric principle is also employed to test the compositional possibilities of arraying a housing unit on a city block to maximize streetscape variety.



(a)



(b)



(c)

**Fig. 12** Perspective renderings of streetscapes in different stages of design development: **a** a simple prototypical unit that Ain designed is arranged in a linear pattern along a street without trees, perhaps leading the overall housing block to appear redundant and monotonous; **b** landscape designs are added to the same housing block so that the monotony in the streetscape is reduced; **c** other elements like trellises, cantilevered entrances, external walls, gates, etc., are added so that visual complexity of the streetscape is achieved. Renderings: Donggyun Ro

The paper further examined the method as a tool to test possible alternatives arranged in a city block, providing dynamic external views from the street. Although arranged in a repetitive pattern, there are no monotonous patterns at all. Ain also argues that if housing units of a given block are designed as such, there could be a number of advantages and efficiencies in construction and the maintenance of any



building problems. The approach is reasonable because all the houses may use the same materials and other infrastructural facilities, such as plumbing, electrical, and heating. Accordingly, it is easy and economical to supply the needed materials and components.

**Acknowledgements** This work was supported by an Inha University Research Grant.

## References

- Ain, Gregory. 1950. *The Museum of Modern Art-Woman's Home Companion, Exhibition House* (exhibition catalogue). New York: The Museum of Modern Art.
- Denzer, Anthony. 2008. *Gregory Ain*. New York: Rizzoli.
- Devenney, Brooke Ashton. 2014. The Evolution of Gregory Ain's Interwar and Postwar Planned Housing Communities, 1939–48. MA Thesis, University of California Riverside.
- Hise, G. 1997. *Magnetic Los Angeles: Planning the Twentieth-Century Metropolis*. Baltimore: The Johns Hopkins University Press.
- Kahan, Bob. 1947. Houses by Gregory Ain (Advertisement). *Arts & Architecture* June 1947: 18 and July 1947: 49.
- Kaplan, Sam Hall. 1988. Ain's Contributions Remembered. *Los Angeles Times*, January 24, 1988.
- Manzer, Lionel and Philip Steadman. 1974. *The Geometry of Environment*. Cambridge: The MIT Press.
- McCoy, Esther. 1954. R.M. Schindler. *Arts and Architecture* 71 (May 1954): 12–15.
- McCoy, Esther. 1984. *The Second Generation*. Santa Monica: Hennessey & Ingalls.
- Park, Jin-Ho. 2004. Symmetry and Subsymmetry as Characteristic of Form-making: The Schindler Shelter. *Journal of Architectural and Planning Research* 21(1): 24–37.
- Park, Jin-Ho, 2006, Arraying Alternative Archetypes: A Computational Model with a Java Applet. *Journal of Architectural and Planning Research* 23(3): 235–246.
- Park, Jin-Ho, 2018, Subsymmetries for the Analysis and Design of Housing Facades. *Nexus Network Journal* 20(1): 251–266.

**Publisher's Note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

**Jin-Ho Park** teaches architectural design, theory, and history as a professor in the Department of Architecture at Inha University, Korea. Prior to joining Inha University, he taught in the School of Architecture at the University of Hawaii at Manoa, USA as an associate professor with tenure. He earned his Ph.D. in architecture from University of California, Los Angeles (UCLA). His book publications include *Graft in Architecture: Recreating Spaces* (Images Publishing, 2013) and *Designing the Ecocity-in-the-Sky* (Images Publishing, 2014).

**Su-Jung Ji** is a Graduate Researcher in the Department of Architecture at Inha University.