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# The Search for Sustainable Architecture in Asia in the Oeuvre of Antonin Raymond: A New Attunement with Nature

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**Abstract:** The American architect Antonin Raymond carried out intense work in Japan from 1920 to 1970. Firstly, coming to Japan to collaborate with Frank Lloyd Wright in the Imperial Hotel almost as an apprentice; unexpectedly, he was to change the game for Nipponese design and construction arts, creating at the same time the path to what currently stands out as a key example of modern environmentally conscious architecture. Due in part to his advanced stance in the profession, architects who now seem pivotal to the rising of a progressive movement in the island-nation were related to Raymond's wake and influence, including Junzô Yoshimura, Kunio Maekawa, and Kenzô Tange. For these reasons, and given the fact that most of the building typologies he designed were previously nonexistent, his oeuvre caused a great impact and consideration, straddled as it is between nature and culture. Such prominent and visionary work, ahead of stylistic Western postulates, often related to mere abstraction, has not been sufficiently recognized in the history of building design. Consequently, the authors propose to settle in this article some of the most significant developments of Raymond's work through his projects and ideas that intended to preserve the environment, such as integrated landscape and orientation to benefit from the sun and breezes, favoring ventilation through adroit design and extensive use of local material left untreated. These hard to assimilate notions would show that Raymond embodied in his work a profound respect for nature and traditions, rooted by its part in Daoism and Shintoism, which paved the way for subsequent innovations of early sustainability in the architectural domain.

**Keywords:** Antonin Raymond; Japanese architecture; environmental design; solar architecture; daoist architecture; contemporary modern architectural design



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## 1. Introduction

Antonin Rajman was born in Kladno, Bohemia (now Czech Republic) on 10 May 1888. In 1910, after finishing his professional studies at the Polytechnic Institute of Prague, he emigrated to the United States.

Raymond became acquainted with Frank Lloyd Wright in the USA and worked under his supervision at Taliesin East, starting in 1916. After the end of the conflict, together with his partner Noémi Pernessin, they came back to the USA and accompanied Wright to Japan to join the team of designers for the Imperial Hotel in Tokyo.

### 1.1. The Situation Prior to Raymond's Arrival

From 1868 onwards, the period of the Meiji restoration, Japan experimented for the first time in 250 years, with a certain openness to foreign moods. This aperture is partly imposed by the so-called uneven treaties by virtue of which the Japanese were forced to sell their products and goods to foreign powers at a fraction (usually 10%) of their real value.

By showcasing their genuine modernity, the dominant Nipponese elites expected to convince these prevalent countries (USA, Germany, UK and France) that they deserved a fairer treatment at least in commerce matters.

Architecture plays a very relevant role in this issue since foreign dignitaries and representatives had to be received at special venues, such as country clubs (the Rokumeikan) and hotels (the Imperial Hotel in Tokyo). They could also find themselves in need of visiting ministries and museums, or even churches (for their faith). Thus, the custom of hiring foreign architects who could teach the Japanese the particulars of modern functional architecture was well established by the end of the 19th century.

In this context appears the singular figure of Frank Lloyd Wright as a person capable of bringing about the feat of transforming the built environment of the country. The surprise comes when, instead of applying modern principles to his main work, the aforementioned Imperial Hotel, he oddly turned to stylistic exercises aimed more at consolidating his own image and altogether lacking audacity or any sort of environmental sustainability, as we will describe in the article.

Fortunately, as it happens, confronted with the “maverick”, came the “reliable” and serious central European, Antonin Raymond, who was truly concerned with “principles” and “fundamentals” and seized the opportunity to entwine the talents of Japanese artistic and cultural expression with his own ideals for Modernism in the building area.

That is why we judge important to explain the details and procedures of his protracted career in Japan and Asia and the complex notions that it entailed.

### *1.2. Methodological Approach*

For the said reasons, instead of a biographic approach, we would like to discuss in a more scientific fashion the structures that he found most revealing in the Asian milieu, and which marked him in contrast with the European perspective. The deep and intrinsic relationship between Japanese culture and nature was his unfailing source of inspiration as he performed a valuable effort for its revitalization.

Our methodology resides in identifying in a somewhat heuristic fashion which of the procedures enhanced by Raymond in writings or actions enclosed more potential for sustainability or can be recognized as positive to such cause. At the same time, the architect would adopt in this insight the role of an interpreter capable of transforming the valuable lessons apprehended from relevant Japanese craftsmen and artisans to induce modernity and sustainable procedures into the mainstream of creativity.

The article aspires to contribute new data to these questions that have increased their relevance in the light of current environmental and climate challenges. To carry out this research, we have visited architectural examples in Japan, India and the Philippines and unearthed original files at the archives of the Getty Research Institute in Los Angeles. Due to his dilated trajectory, we would try to outline only the fundamental realizations and facts of Raymond’s career.

He hailed from a family with part Jewish ascent, settled near Praha in Bohemia, which is justly known as the crucible of many revolutionary artistic and philosophic movements; thus, he was to become a true xenophile who subsequently reacted strongly to the unexpected beauty of traditional Nipponese architecture and art. He extracted many lessons from Japanese traditional solutions with which he was deeply acquainted as an aftermath of his repeated sojourns and expeditions in Japanese and Chinese traits prior to the Pacific War. Raymond always believed that local conditions must play an important role in crafting modern architecture [1]. In this respect, he was particularly keen in employing traditional materials suitable for the environment. In fact, this remained a constant trigger for issues during his partnership with Wright for the building of the Teikoku Hotel. On this point, Raymond mentioned: “The first principle which all great architecture teaches us is to regard local conditions as the fundamental factor from which to begin, and to let the structure flow with a logical shape inspired by local conditions. Plants and animals behave like that in diverse environments” [2] (p. 155). At this trail, he was to be followed years later by Bruno Taut during a brief but intense sojourn (1933–1936).

The relevance of this research is founded in one of the last underdeveloped ideas of Karl Marx, namely the effort to re-culture nature and re-naturalize culture [2]. Ar-

guably, Japanese Culture, being consistently rooted in Daoism which enforces nature as the primeval referent [3] and having stayed isolated from the rest of the world for more than 250 years, in the period known as Sakoku, had arrived very close to this Marxist notion. We envisioned that it was a matter of time until other fortunate European intellectuals as Raymond, realized the potential that such civilization offered for modernity and started to diffuse it in the environmental and constructive domain.

### 1.3. The Inception of Solar Houses

In his autobiography [4], Raymond introduced the name “solar houses” for his early realizations of the 1920s and compared them to similar initiatives in America. Solar architecture at the time, referred to one which was heliocentric for reasons of health, energy and perhaps social considerations (since the name “solar” also happens to mean “palace”), but living and learning from a country with reverence for the sun (the goddess, ancestor of the Emperor) and nature (the Dao), he expanded the concept to cope with the prevailing geomantic notions of Fengshui 風水 (jap. Fusui) which mainly included adroit management of water around buildings, favorable and undesirable winds, ventilation and solar exposure, as well as rejection of manufactured materials in favor of reed, thatch, wood and stone, deemed to be more reliable and easily reconstructed in case of disaster.

There is no modern exact equivalent to this notion, it is a mixture between bioclimatic, environmentally conscious and sustainable architecture but with a spiritual nuance pertaining to Japanese animism (Shinto) and Daoism. We have kept “Solar Architecture” as a witness to the words coined by the same Raymond in his writings.

During an interview conducted by Kenzô Tange in 1960, Raymond spoke about his impressions upon arrival in Japan: “As I certainly participated in the new movement in Europe and was so to speak let alone at that time, 1920, in the U.S.A., imagine my surprise when I arrived to Japan in finding here expressed in Nipponese farms and Shinto shrines as the famous Ise, all the features which we so fervently craved to reproduce in the new modern architecture although we were at the time far from realizing and perchance will never will be able to achieve those ideals ( . . . ) The people, their garments, their utensils, their pottery, paintings, gardens, all expressed a wonderful unity of purpose starkly developed through centuries by a natural process like anything else in nature. It revealed to me an unsurpassed love of nature with upper case “N” and a divine influence” [5] (p. 308).

In 1921, at the age of 32, Raymond began his career as an independent architect in Tokyo, by adaption of promising technologies to traditional and vernacular Japanese forms. However, architecture was not his only means of expression since he was also an accomplished painter, sculptor and musician. Kunio Maekawa, who worked with Le Corbusier in France, and Kenzô Tange were two of the many assistants who collaborated with Antonin Raymond in revitalizing the Nipponese tradition in the contemporary scene [6]. Raymond clarifies that: “Tange is verily an artist and comprehends the Japanese traditions, as well as all the arts. He is a good writer. He lectured at Harvard ( . . . ) He once told me that I can afford to do things Japanese but he cannot follow my example. He must do things Japanese, and in order to create in a modern spirit and creative spirit, he has to invent a new tradition” [7] (p. 250).

Antonin Raymond penned a series of articles about his experience in Japan [4,8]. More recently, Helfrich and Whitaker published in 2006 a thorough account on Raymond and his intention to re-create a modern world [5]. However, we feel that these recent printed works [5,7–9] have not contributed to clarify the deeply rooted relations of Raymond’s stances with cultural and environmental features of Japanese architecture, which we believe remain largely dormant for most Western experts. In other words, through former articles about this matter, Raymond is presented almost as the solitary hero who accomplished more than he could, considering the adverse circumstances. Instead, our approach is based on the tenet that he acted more as a living nexus making ends meet between the native vernacular and the ecologically advanced modernity.

Moreover, based on the authors' investigation of Japanese architectural realm for more than three decades, the objective of this article is to showcase that the aftermath of his Asian experiences was in fact the achievement of a new understanding of nature as a form-giver for future architectural realizations, as Walter Gropius himself was to recognize in a famous postcard of Ryoanji's rock-garden sent to Le Corbusier in 1957.

The missive said: "Dear Corbu, all what we have been fighting for has its parallel in old Japanese culture. This rock garden of Zen-monks in the 13th century—stones and raked white pebbles—an elating spot of peace. You would be as excited as I am in this 2000 years old space of cultural wisdom! The Japanese house is the best and most modern I know of and truly prefabricated" [9].

On contemplate inanimate rocks covered in moss and gravel, Gropius declared that all the values pursued by the modern movement in architecture had previously occurred in Japanese culture, deeply rooted as they were in nature and in relation to the former, that the Japanese house was the most advanced that he (former director of the Bauhaus) had seen.

It is important to stress on this behalf, that the notions preconized by Raymond's oeuvre were not merely limited to the surface in an expressionist way but had to be manifest from the core conception of the accomplished building.

Relevant examples of his work can be found in many countries, including Ireland, the Philippines, Hawaii and the United States. Raymond was inducted to the American Institute of Architects in 1952, and in 1956 received the award of the New York Association's Medal of Honor. He received accolades from different governments, such as the Third Class Order of the Rising Sun and a badge of honor for life in the Japanese Institute of Architects.

After leaving Japan, he placed his own studio and farm in New Hope (Philadelphia, demolished), in a building reminiscent of unrealized ideas by Le Corbusier for the Chilean diplomat Errazuriz, with whose sketches he had experimented in his own Karuizawa studio. He died at the same premises on 25 October 1976.

## 2. The Path to Raymond's Architectural Evolution

In the following pages we will trace a timeline that starts in 1919, when the Raymonds first arrived in Japan to partner with Frank Lloyd Wright in the construction of the Imperial Hotel. We will describe the significant works and events that led him to adopt a novel environmentally conscious attitude towards projects and to introduce "solar design" as he named it [2] in his creations. When necessary, we will introduce scientific tools, such as sunlight simulation as in Section 4.1, to demonstrate the main points that we would take into account.

### 2.1. The Making of the Imperial Hotel

In this subsection we would describe in brief the aftermath of the building of the Imperial Hotel in Tokyo.

Raymond's partnership with Frank Lloyd Wright continued with a year-long sojourn to sort out the erection of an emblem hotel intended to impress foreign dignitaries and visitors. Although Wright had performed several brief stints to the island-nation, their association became problematic, because the American expert was not prone to acknowledging local singularities, especially those related to the climate and building materials. After a year working on the Imperial Hotel, Raymond turned sour due to the "incessant reiteration of Wright's manners and moods", to which he could not respond positively. Moreover, he had the impression that "the design did not bear any relationship to Japan, neither to its climate, traditions, or people and culture", and consequently "the lodge finally transmogrified in a cenotaph for the effigy of the same architect." [2] (p. 76) (Figure 1).

On the other hand, Wright's opinion about Raymond's work was reflected in some letters the American expert sent to R. Schindler. At that time, Schindler was assisting Wright in the construction of the Aline Barnsdall's Olive Hill Complex in Los Angeles while he visited Japan.





**Figure 1.** Imperial Hotel reconstruction at Inuyama (Gifu), showing masonry, excessive ornamentation and open disregard for local conditions and climate. 1—In grey: baubles and decorations in stone, resembling Mayan claddings. Stone is a very unusual material in façades in Japan, inadequate for resisting seismic forces and it was nowhere to be found near Tokyo. 2—In clay color: artistic brickwork which besides its rarity had already proven a failure on former buildings, especially when subject to earthquakes and other stresses. Source: authors.

Schindler, who had worked with Raymond at Wright's studio before they moved to Tokyo, attempted in vain to defend the posture of his former colleague. Lastly, Raymond received a letter of termination.

From the former it seems clear that Raymond made a strenuous effort not entirely devoid of insecurity, to free himself from the strict mind-frame of Wright's whims in design. At the same time, Raymond's preoccupations were far from stylistic and belonged to a realm from afar. After quitting with Raymond, Wright sent several letters to Schindler expressing discontent and the need to find a replacement for him. In one of them Wright even pointed out his dissatisfaction and mixed feelings.

Schindler and his colleague Neutra, whom he had encountered at his time in the academia at the Vienna University of Technology, had been taken into consideration as replacements for Raymond. Actually, they planned to visit Tokyo. In this aspect, Wright wrote to Schindler stating his approval of the plan to work on a new hospital (probably St. Luke's Hospital).

Nevertheless, Wright's work in Tokyo ended abruptly, and as a consequence the two architects' desired journey did not take place. Therefore, Schindler could never travel to Japan although he had a great interest in Japanese architecture. In fact, one year later Schindler built his studio and own house in Los Angeles, the innovative and iconic Kings Road House, that shows clear relationships with deep concepts of Japanese architecture [9]. Neutra lived and worked with Schindler at Kings Road House between 1925 and 1930. Subsequently, Neutra could finally travel to Japan. He arranged a trip of several weeks to Japan, which was achieved through the help the Tsuchiuras.

In Japan, Neutra gave lectures and visited Tokyo, Osaka, Kyoto (including the Katsura Imperial Villa, a must for Bruno Taut) and Nara. For his part, Kameki Tsuchiura also encountered Antonin Raymond when he came back to Japan. He worked at Raymond's studio in Tokyo, and in addition, commented in the introduction for the first major pub-

lication of Raymond's work in Japan; published in 1931, in Volume 19 of *Kenchiku Jidai* (Epochs of Architecture) [10].

## 2.2. *The First Structures Realized in Concrete in Tokyo*

Bitter departure from the postulates of the former mentor resulted paradoxically in the introduction of modern structural materials and especially concrete, but its manifold functions and austerity had to produce a remarkable effect for design and expression in Japan, as we describe here.

At the beginning, Raymond carried out unassuming commissions for small and private villas with a certain Western style that the Japanese were not capable of reproducing at the time. The foreign colony in Tokyo was one of his main sources of commissions, and more specifically, foreigners in charge of teaching equipment, medical attention, religious services, and so forth. In time, he evolved considerably in the typology and techniques of detached residences [11].

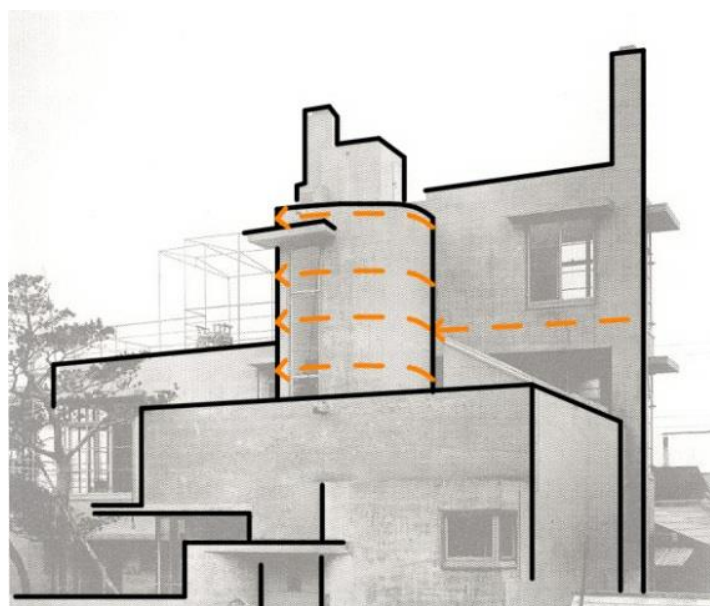
The plot of one of his early buildings in Japan, the house for Dr. Rachel Reid near Azabu, was too large for his client. Accordingly, she gave part of the land to Raymond who built there his first residence in Tokyo (no longer extant). Regarding this house, Raymond explained that the rooms' orientation to the south to bring in sunlight, the windows' positions based on ventilation and daylight, and the principle of using unmanufactured materials were all inspired by Japanese traditional architecture. This constitutes an early move towards solar architecture.

Raymond used a type of concrete that he emphatically called monolithic. He had found from the works at the Imperial Hotel that stone was scarce in Japan and lacked the tensile properties of traditional wood employed for residences. As an ideal substitute, concrete was reinforced, but only with non-corrugated steel. Many of the materials were left exposed in their original state, re-instating the Japanese-architectural idea in which he disagreed with Wright: "the ornament should be part of the surface but not lie on the surface" [8] (Box 1-f.1, 31057). Accordingly, Raymond reproduced as much as possible the ancient simplicity of the Japanese spirit by bringing in modern techniques (Figure 2).



**Figure 2.** Raymond's Reinanzaka House in Tokyo, entirely realized in monolithic reinforced concrete (1923). Source: authors.

Raymond came to the point of channeling the water with ropes and bamboo instead of gutters. In addition, he designed large windows and screens that served as sliding doors that induced a stronger flow of space (and air) from the quiet interior to the green outer spaces [12]. The openings were protected by deep overhangs taking into account solar angles and other types of sunshades that contribute to darkening the indoor spaces, as they performed in Japanese traditional architecture (Figure 3). These interiors seem to be appreciated by the Japanese mind and they are the matter of a famous essay named “In Praise of Shadows” by the novelist Junichiro Tanizaki. On this point, he mentioned: “In making for ourselves a place to inhabit, we first spread a kind of parasol to cast some shadow on the earth, and in the pale light of this shadow we assemble our house” [13] (p. 28). As a curiosity, Raymond designed metal tube chairs prior to those realized by M. Breuer.



**Figure 3.** Sketch showing the dynamic plasticity of concrete in Reinanzaka’s house. Source: authors.

The poet and playwright Paul Claudel (1868–1955) became a close and valued friend of Raymond while he served as French ambassador in Japan (1921–1926). In 1927, Antonin designed a house and chancery for him. That year, Claudel wrote the essay “On Antonin Raymond’s House in Tokyo”, firstly published in French in the *Nouvelle Revue Française* in 1927 and later in Japanese (1930), in which he writes regarding the incipient modernity of the Raymond residence and its close relation with the exterior: “Nothing is more sad than our typical window, which seems made less for the intake of air and light than for excluding them with its multiple layers of jaded glass and curtains. The Japanese House on the contrary, with the deft shelter of its eaves and verandas which protect it from the blizzard and storm, and by the mutable play of its light screens, opens up the entire width of the paper wall to the outer scenario” [2] (p. 102).

This is the first example of the transformations towards environmental architecture that Raymond had envisaged for the contemporary scene of Japan which, through a fortunate combination of skill and circumstances, became rather successful [13].

### 2.3. Influence of the Kantô Earthquake (1923)

In this subsection, we would comment as previously mentioned, that the former platitudes of intellectual theories and cultural discussion were soon to be put to the test by the power of Japanese untamed nature and the rise of militarism, especially after constating that other more peaceful efforts were doomed.

Raymond was content to proceed with his architectural inventions unaware of the imperialist policy decreed by the Japanese authorities. At that time only architects acquainted



with the military were selected to work on the development of cities in overseas territories, such as Manchuria, as well as other regions occupied by the Japanese in China and Korea, including Harbin, Dalian and Shinking (currently Changchun).

Life seemed to pass peacefully in Tokyo until one tragic event boosted Raymond's career in Japan: the great earthquake of 1923. The architect was surprised by the magnitude of the catastrophe in his studio, but he and the rest of his staff were able to escape. Later, near Shinagawa station, Antonin found Noémi with their son Claude. Fortunately, Reinanzaka House had resisted the earthquake unscathed [14].

Astonished by the intensity of the damages due to the disaster and the large number of casualties, Raymond was personally involved in humanitarian aid. By chance, the Imperial Hotel also resisted the earthquake with little damage. Frank Lloyd Wright exultantly spoke about it in his biography.

Gradually, daily life was restored, and his studio activity became frantic in order to reconstruct as many buildings as possible. The constructive techniques that Raymond pioneered, based initially on reinforced concrete unlike those of brick used by Josiah Conder and Wright, were validated as more durable and independent of excessive lumber exploits which heavily damaged the forests and environment of Japan. An appropriate substitute for wooden construction had apparently surged. On the contrary, the American steel construction applied among other buildings in the Marunouchi department store was found unacceptable for seismic activity and had to be discarded or reconsidered. Since then, the earthquake resilience was one of the main features of the Raymond signature; therefore, references to this characteristic can be found in almost all his later sizeable works [15].

### 3. Early Achievements and Results in Climate Responsive Houses

In this section we will describe how Raymond's trajectory consolidates and the term solar housing is made explicit in his own words through realizations of private villas, such as Karuizawa's and Viscount Hamao's residence, and also by virtue of dissemination of his ideas in books, articles and sundry lectures. These are chosen as been considered the higher exponents of a subtler approach to the problems presented by dwelling with nature.

#### 3.1. *The House for Viscount Hamao*

The starting point of this trend was marked by this project. In 1927, Raymond carried out an important work for a Japanese nobleman. It should be remembered that the aristocracy or Kizoku remained in Japan well beyond the signature of the armistice. In relation to that work, the architect himself claims to have reached a cultural syncretism in which environmental Japanese features are enclosed, resulting in a house that can be considered as a precedent for the first American "solar" houses [16]. Raymond states about the home that "such design was a precedent of homes which even today could be taken as contemporary; not only in the disposition of an open plan and adequate orientation, but also in the handling of materials, maintained untreated as much as possible, and the use of plywood for inner partitions, etc." [2] (p. 118).

In truth he inadvertently foresaw the ideas of Bruno Taut, who in his Japanese sojourn wrote [17] "Hence until now Japan cannot possess her own architecture if such is not developed in accordance to its own climate ( ... ). Nevertheless, this is very difficult to achieve and perhaps impossible in the short term for the Japanese themselves. Several centuries must pass before they are ready to act in this manner without the help of foreigners. The traditional Japanese house can no longer be inhabited by the current people of Japan ( ... ). People who sit in chairs and tables will no longer stay crouched under the kotatsu (brazier) huddling into several layers of kimonos or remain trembling in the floor while the cold winter winds blow through the shattered shoji."

It is delightful to imagine some kind of encounter between the two European masters, perhaps the status of refugee of Taut, and the difficult relationships that Germany, the Czech Republic and also the USA were holding at the time, prevented it from happening. It is a matter though in which we would surely produce further research.

### 3.2. Raymond's Karuizawa Summer Studio in the Wake of Le Corbusier

A further development in this typology appeared as soon as 1933, when the Raymonds built a summer residence to carry on with some of their commissions during the hot and humid summer of Tokyo. The building design was based on the Le Corbusier's plans for the mansion of M. Errazuriz in Chile but adapted to Raymond's previous achievements (Figure 4).



**Figure 4.** Raymond's Karuizawa summer studio (reconstruction). An accomplished vernacular reconstruction of Le Corbusier's sketch for the Errazuriz House at Zapallar, near Valparaíso (Chile). (a) General outlook; (b) external view of the studio. Source: authors.

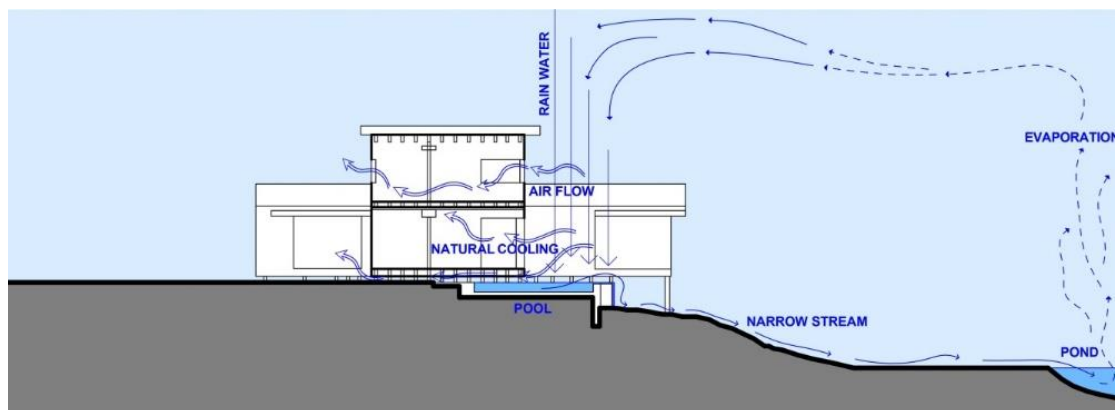
When the Swiss-born architect first heard about the matter he reacted warily but later, on May 7th of 1935, Le Corbusier sent Raymond a letter stating: "Please rest assured that there is no bad feelings between us, but—as you used to say—you made a slight mistake, that is, you forgot to send me a note when you published the images of your nice Tokyo house, which is very pretty, by the way" [3] (p. 332).

Moreover, in October of that year Raymond spent several days with Le Corbusier in New York. Hence, the disagreement for the plagiarism regarding Raymond's Karuizawa summer studio was apparently resolved. In fact, when in 1940 Le Corbusier obtained a commission for developing an urbanization plan for the city of Izmir in Turkey, where Taut had worked two years before, he sent Raymond another missive asking about his experience on dealing with earthquakes in Japan: "The country is subject to earthquakes. As yet I have never had any cause to investigate this issue. Could you send me some documentation on the matter, since you have dealt with it in Japan? There must have been some publications on this problem. You might include an account of your own experience" [4] (p. 338). This harks back to the acclaim that the Reinanzaka house had achieved in Europe, especially among the French intellectuals.

In Raymond's Karuizawa summer studio, currently the Paynet museum, everything was based on the skills of Japanese traditional carpenters. The architect used local chestnut timbers, rudimentary polished with sand and straw and having only the bark removed. Local igneous rocks (lava and magma) were selected as the aggregate for cement. In addition, *sugiki* wood (cryptomeria) from nearby forests was employed for the boards, the roof was covered with *karamatsu* straw (a type of larch), *kaya* (miscanthus) reed, and *sudare*, or typical shutters, were made from bamboo. The construction incorporates a makeshift system of evaporative cooling which relies on the vicinity of a lakeside (Figure 5). The orientation of the living spaces was set to the south as it usually happens in east Asia, although Le Corbusier made no mention of this matter in his sketch and could not have, being at the time fairly unaware of the subtleties of solar geometry and especially in the southern hemisphere where Chile lies. In this way the breezes from the lake are also de-



flected to cool the inner rooms. Much later Raymond was bound to enact a similar diagram for his farm and studio in New Hope (Pennsylvania), not without hindrances due to the different climate and latitude. In fact, the New Hope studio has been recently demolished, while Karuizawa's still receives visitors and activities with nominal refurbishments.



**Figure 5.** Karuizawa summer house, section, natural ventilation and water cycle, it predates eco-friendly, sustainable houses. Source: authors.

To a significant extent, it could be argued that Raymond tried to reinforce the Japanese aesthetic concepts of *wabi* (lack of decoration as a result of the pursuit for the bare essence) and *sabi* (depicting or anticipating the passage of time) through modern environmental trends predating sustainability in architecture. According to Bruno Taut, natural wood represents in Japan “the beginning and the end, youth and old age. Beautiful wood that is simply old is not elegant due to its appearance, but because it has endured a long winding journey, or we could state, a spiritual experience” [18] (p. 91). Following this Japanese concept, Raymond’s friend Schindler adds that the wood only needs to be “slightly brushed to accentuate the textures” [14] (p. 20).

Thus, in Raymond’s Karuizawa studio, all unnecessary ornaments were removed to attain vacuity, and thus “leave it to everyone’s insight to appreciate what it has enshrined” [19] (p. 89). On this point, Raymond commented that in the Japanese space “it could seem that the wish to dispose with the useless, to clean the space, to look for the essence in everything, eventually, in the silence so created, one hears the pure voice of the form, of the substance and the space” [2] (p. 151).

With hindsight, it seems clear that Raymond innovated against all odds whenever he was able to adapt the sleek plans of avant-garde architecture to Nipponese vernacular construction and philosophy, which implied natural and even arborescent features. Ironically, the Karuizawa studio, deftly thatched with local *kaya*-reed, was on occasion referred to as the “hovel of an African chieftain” [2].

### 3.3. Publication and Dissemination Efforts, Book: Antonin Raymond, *His Realizations in Japan, 1920–1935*

To prove that Raymond’s findings were not incidental, we will analyze the subsequent printing efforts. His first book was published by Jōnan Shoin in Tokyo in 1938 with an initial print of 700 copies. In 1939, second and third printings were published, reaching 502 and 350 copies, respectively. In this relevant book, now almost unavailable, Raymond explains his architectural concerns before leaving Japan due to the increased pre-war militarism. Among other things, Raymond noticed a belligerent atmosphere when his second son Claude returned from the school on a tank’s deck, despite having been treated well. Raymond points out in this book that:

“Everything fulfils a keen purpose and is only sufficient in relation to that purpose. The greatest satisfaction which a Japanese experience, can be found in the balance which the inhabitant identifies between the idea, the act and the results, both through space and

time ( . . . ) The Japanese worships nature fervently, much more than us, and he reveals it by making sacrifices for it which we are not willing to perform. The garden and the house constitute an indissoluble one.” [2] (pp. 150–153).

It is convenient to stress that Raymond developed in the latter sentence the concepts of *katei* 家庭 (literally, house-garden) equivalent to “home”, as well as *shakkei* 借景 or borrowed landscape. With the exception of the *genkan* 玄, the “hidden barrier” where shoes must be removed and some other minor aspects, it is astonishing that Raymond was able to distinctly recognize key points of the Japanese domestic tradition that even many natives are not able to perceive. He went so far as to tolerate and praise Feng-Shui and other geomantic rites to be performed and implemented for some of his buildings, such customs prescribed the southern orientation of the buildings referred elsewhere [20].

#### 4. Pacific War Exiles and Life in India: Ashram for the Guru Sri Aurobindo (1937), Church in Negros (Philippines) (1948), International Results

In the following section we will analyze two important examples developed outside Japan in purely tropical surroundings, which challenged Raymond’s postulates and capabilities.

Forced to leave Japan in 1937 due to the war-mongering atmosphere and increasing hostility towards foreigners, Raymond moved to Pondicherry (India), where he had been commissioned to build a complex for Sri Aurobindo, a sage and guru who took refuge in southern India (French territory) to elude the British authorities that had falsely accused and incarcerated him.

Raymond started to design the project in Japan with the participation of the architect Maekawa, who had stayed for a couple of years with Le Corbusier in Paris. Based on the original design, Raymond proceeded to roof the building with a kind of vaulting realized of precast concrete to induce more ventilation in such harsh climate [21]. Soon to be artists, such as George Nakashima (sculptor) and François Sammer, collaborated under his guidance. In this pristine resort, in which he himself had to live, he further experimented with the concrete-frame typology built manually by the acolytes of the Guru. In order to open the building to the outside and thus respond to the requirements of a tropical climate, the south façade was designed with long horizontal blinds, probably constituting the first modern large-scale brise-soleil (Figures 6 and 7). In the plans Maekawa minutely writes the French word *persienne* to refer to this shading system [22]. Even the windows were (and remain) unglazed, thus avoiding greenhouse effect.

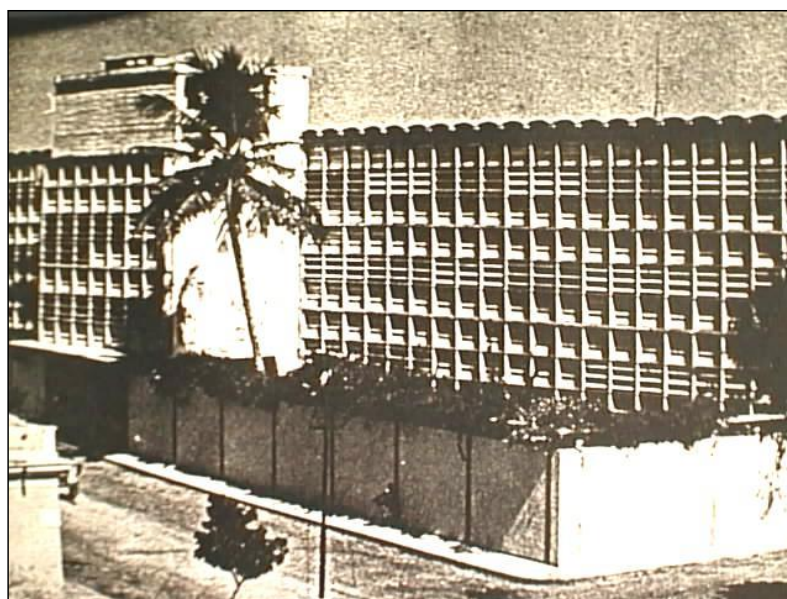


Figure 6. Ashram of Sri Aurobindo. Pondicherry, India.

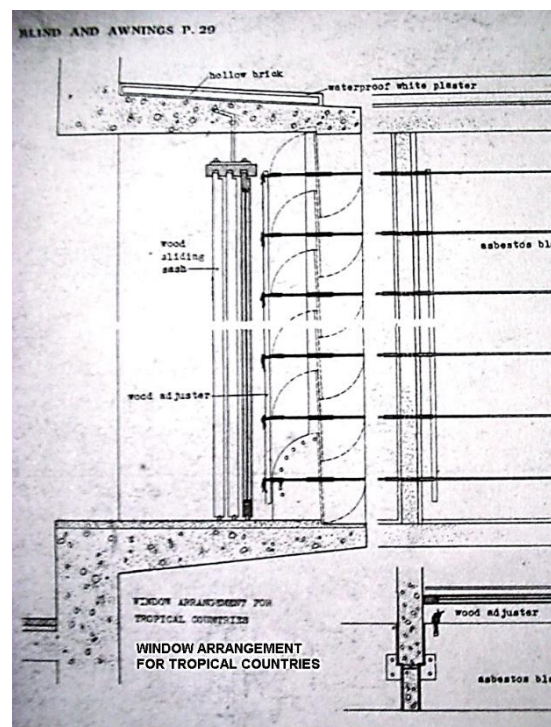


**Figure 7.** View from the south of the sleeping quarters in the Ashram of Sri Aurobindo. Pondicherry, India. Particular of the external louvers. Source: authors.

In his first Japanese stint, he had deeply studied the radiative intensity of the high subtropical sun which can only be subdued by reflection and never admitted directly.

Moreover, Raymond could have become acquainted with the systems implemented by Mamoru Yamada at the Tsurumi Residence in Tokyo (1931) in which he incorporated interesting systems to track light and induce ventilation, such as sunspaces and rotating glazing panes that could be covered with built-in fabric to perform as a sort of louvers [23]. That would be a clear precedent to the slat-clad façade that is the main visual characteristic of the Golconde Ashram building.

Such effort resulted in the labeling of a construction detail of the unglazed window cum louvers with the compelling sentence: Window Arrangement for Tropical Countries [24] (Figure 8).



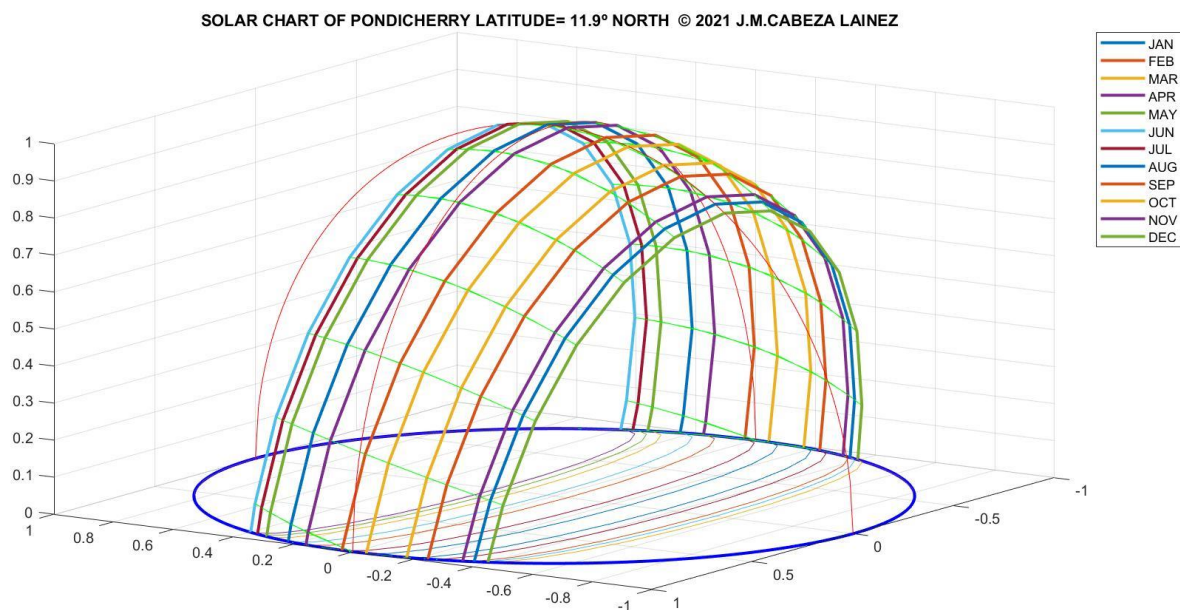
**Figure 8.** Detail of the pivot system for the façade, indicating the adroit solution (arrangement) devised for tropical countries and the absence of glazing to increase ventilation. Source: authors.



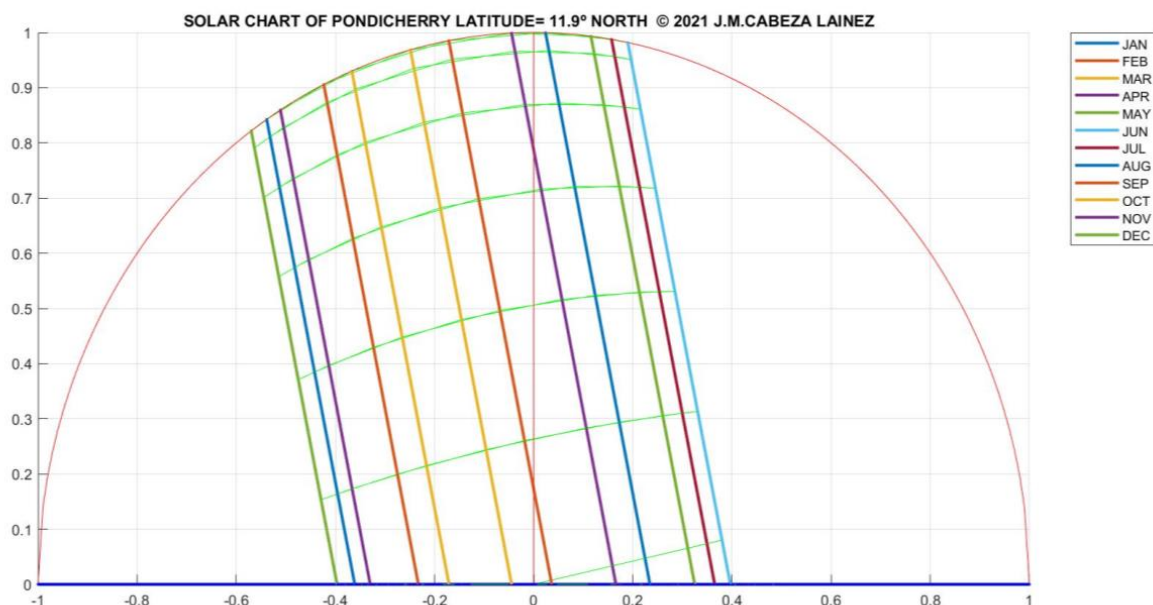
This building is still in perfect use after 85 years, it featured a Japanese garden with lanterns and a pond and some worship halls. It reveals how a detailed lecture of local climate, or in other words “the soul of the place” is able to produce transcendental architectures with the simplest means and resources through integration with a spiritual community.

#### 4.1. Solar Analysis and Simulation of the Aurobindo Ashram

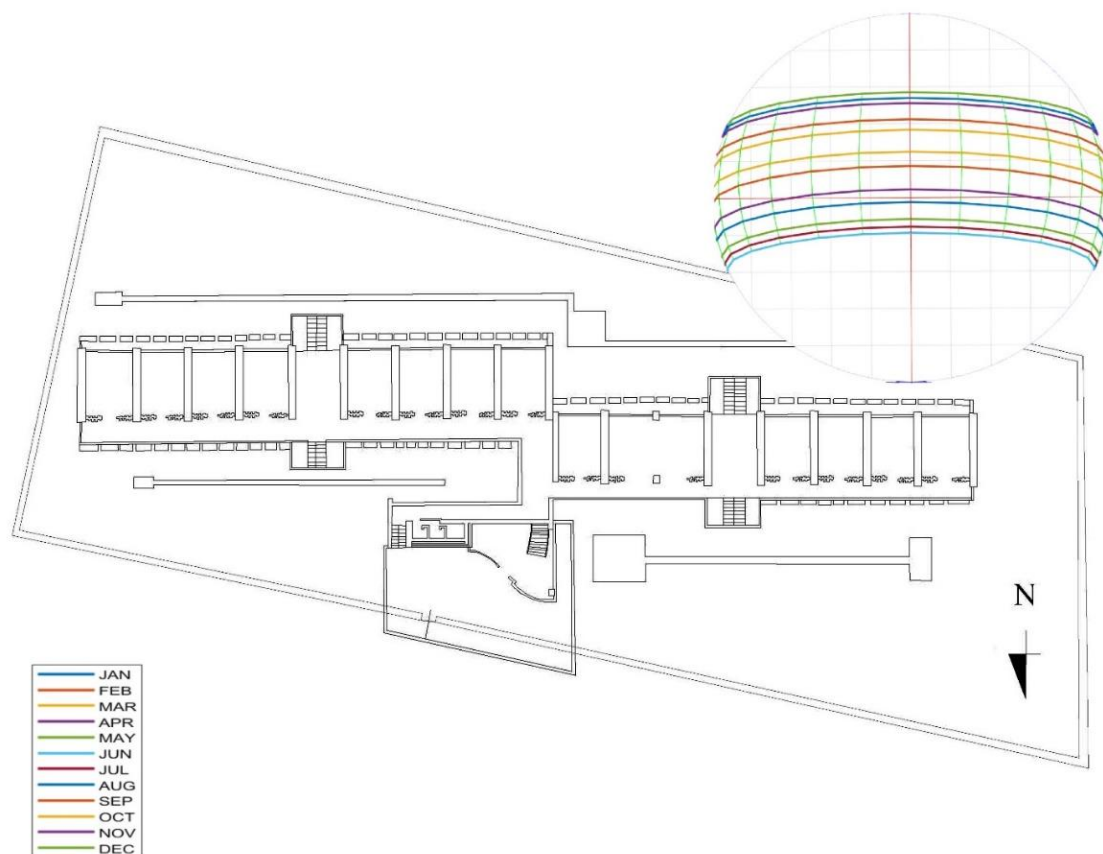
To demonstrate the effectiveness of Raymond’s ideas, cast intuitively, we have simulated the solar trajectories (Figures 9–11) for this building to ascertain that the orientation and louver details are well adapted to site and local climate.



**Figure 9.** Simulations of the solar movement in Pondicherry (India) created by the authors. Three-dimensional movement. Source: authors.



**Figure 10.** Simulations of the solar movement in Pondicherry (India) created by the authors. Elevation. Source: authors.



**Figure 11.** Plan of the Golconde Ashram with orientation and reduced scale indication of the solar movements in all months. Source: authors.

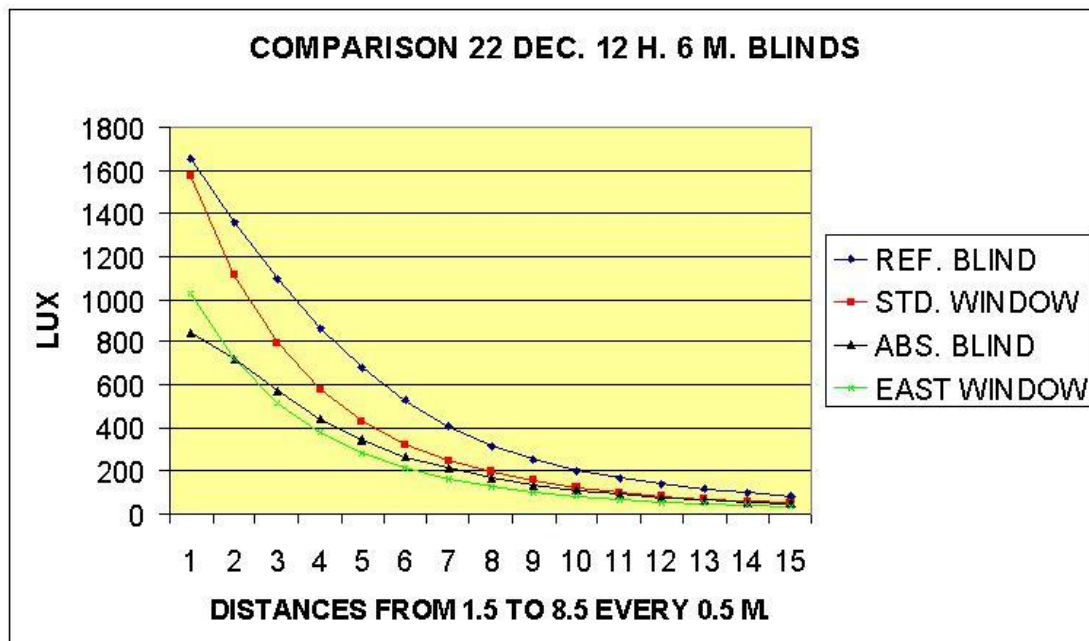
Following the solar study, we conducted a sunlight simulation [24] for the current device and several alternatives, such as the ordinary window or different finishes for the slats (Figure 12). The behavior, recently checked with monitoring by architect Mona Doctor-Pingel, seems adequate since, in the particular case that the system is set to a horizontal position, the increases of illuminance are relevant as compared with a normal window, which is hardly predictable without computer tools [25]. The louver device is kept in a good condition and well maintained by the disciples even in the curious absence of glazing (which avoids the build-up of greenhouse effect). In the site a real scale model (in wood) of the shading system attached to a single room is still preserved.

This building was one of the few key works of modern architecture completed at that time in India and is still the most important outside the Chandigarh area. It came to be considered as a pioneering and outstanding response to the tropical climate [26]. The project was to be inspirational and heavily disseminated through the book *Tropical Architecture*, by Drew and Fry, who also collaborated with Le Corbusier in Chandigarh's main works.

Otto Koenisberger, who started a practice in India in 1939 and in 1951 became the director of the Tropical Department of the Architectural Association in London, took good notice of the innovations and achievements developed by Raymond at Pondicherry.

It is convenient to notice that the Golconde Ashram bears some similarities with the Ministry of Education in Rio de Janeiro, designed by Lucio Costa, Oscar Niemayer, and other Brazilian architects inspired by Le Corbusier, though actually built later in 1943 [27] (Figure 13).





**Figure 12.** Raymond’s Golconde Ashram, computer simulation (section) of the performance of the current louvers (blue diamonds) and dark painted slats (black triangles), the same window without blinds oriented to the south (red squares) or to the east (green “x”). The existing system if set to a horizontal position, increases illuminance significantly as compared with a normal window. Source: authors.

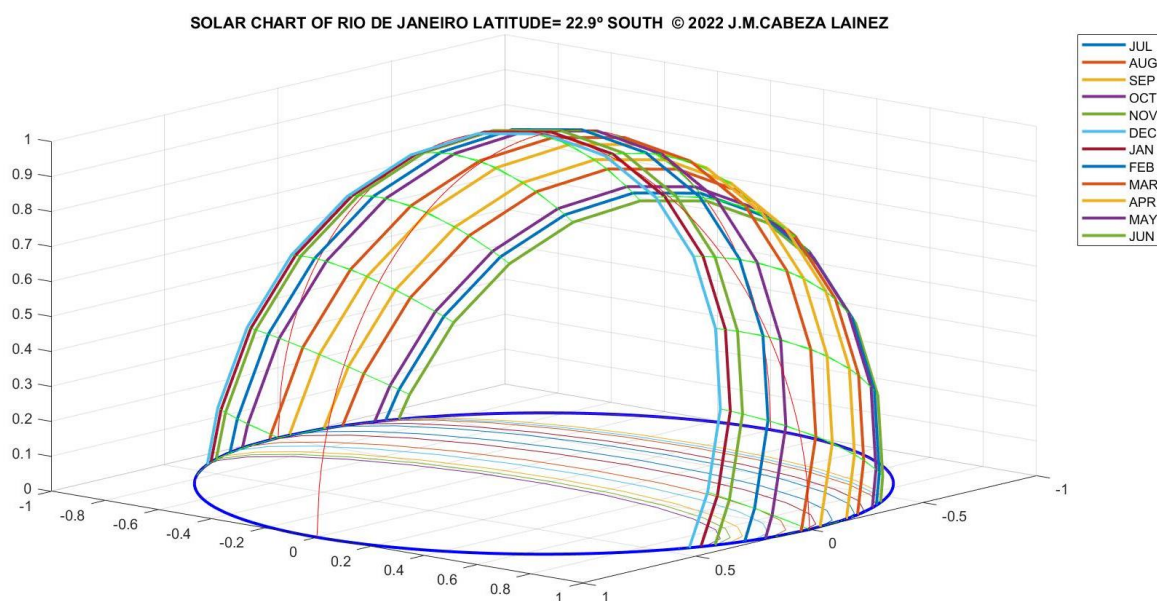


**Figure 13.** Brise-soleil of the Office of Educational Authority at Rio de Janeiro, 1943. Source: authors.

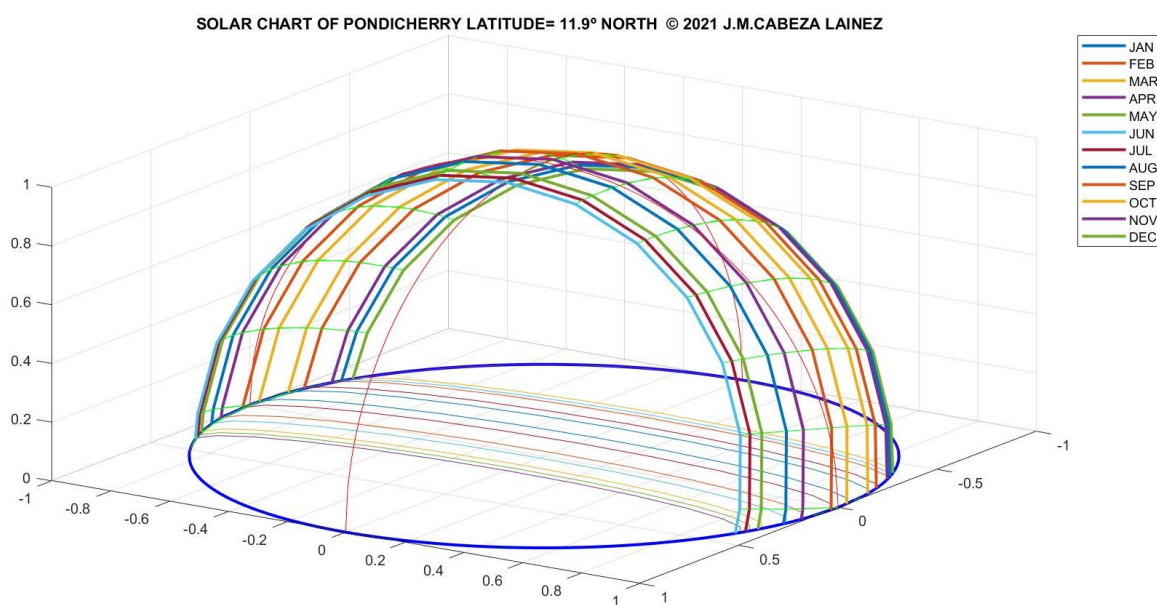
Richard Neutra, a colleague of Schindler’s at the Vienna University of Technology who met Raymond at Wright’s Oak Park studio before his trip to Japan, was also interested in the brise-soleil experiences that were being carried out in South America. In this regard, Neutra explains, seemingly forgetting about Arabic architecture, that “no other element in and by South American architects has received as much attention as the ever-present blinds and integrated architectural devices for shading the outside of facades and windows.” [28] (box 01: folder 178 Counter-solar devices labeled A-50, 1946).

To this aim we have compared the solar trajectories for the building of the Ashram and for that of the Ministry of Health (Figures 14 and 15), both evolved as design estimates by

intuition in places completely foreign to Western climatic traditions, but they show adequate behavior and performance after more than 80 years of their respective construction.



**Figure 14.** Comparison of 3D solar trajectories in the Ministry of Health.



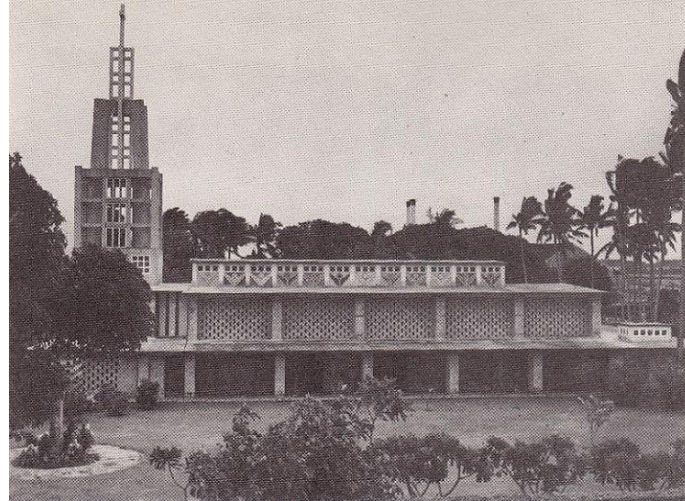
**Figure 15.** Comparison of 3D solar trajectories in Golconde Ashram.

Although some would speculate that Le Corbusier's sketches could be traced on the inception of the two projects, in India and Brazil, it becomes clear that Raymond's brise-soleil formulation, entwined with his own Asian experiences [29], does not showcase the disadvantages that have affected the operation and maintenance of the brise-soleil at Rio de Janeiro [30]. We can sum up such divergences by arguing that Raymond's building became more than simply rationalist, by stemming from authentic Asian architectural solutions, while being responsive to the local climate. Unfortunately, there was no such architectural tradition in Brazil, whose earlier buildings were content to try and imitate old-fashioned Portuguese models. This fact could also explain the intriguing reason why there are no courtyard houses in the Brazilian Sertao (desert).

#### 4.2. Example of a Church Adapted to the Warm-Humid Climate

Another stance of the kind of adaptations devised by Raymond in response to tropical countries is the almost forgotten church of Saint Joseph, built in a remote sugar factory near Victoria on the isle of Negros (Philippines).

In this simple but convincing project (Figure 16), Raymond incorporates perforated walls for ventilation and a belfry tower to provide daylighting to the main altar.



**Figure 16.** The Church of St. Joseph in Victoria, island of Negros (Philippines).

In this case, the concrete frame is also employed but to a bare level and very similar to wooden construction. As in most vernacular buildings throughout the island there is no solid wall, but the significant difference with the traditional is the deft use of skylights, largely unheard of in eastern Asia. Monitoring of the interior of the church has revealed a satisfactory lighting performance (Figure 17).



**Figure 17.** View of the daylit interior of the church with registers of 400 lux, at the time of the photograph (July, 12 h). Source: authors.

Some 80 years after its completion, the building is still much in use and is greatly appreciated and preserved by a thriving community, which is gathered around this intriguing church amidst the jungle.

#### 5. Definitive Return to Japan: A Statement on Architectural Maturity

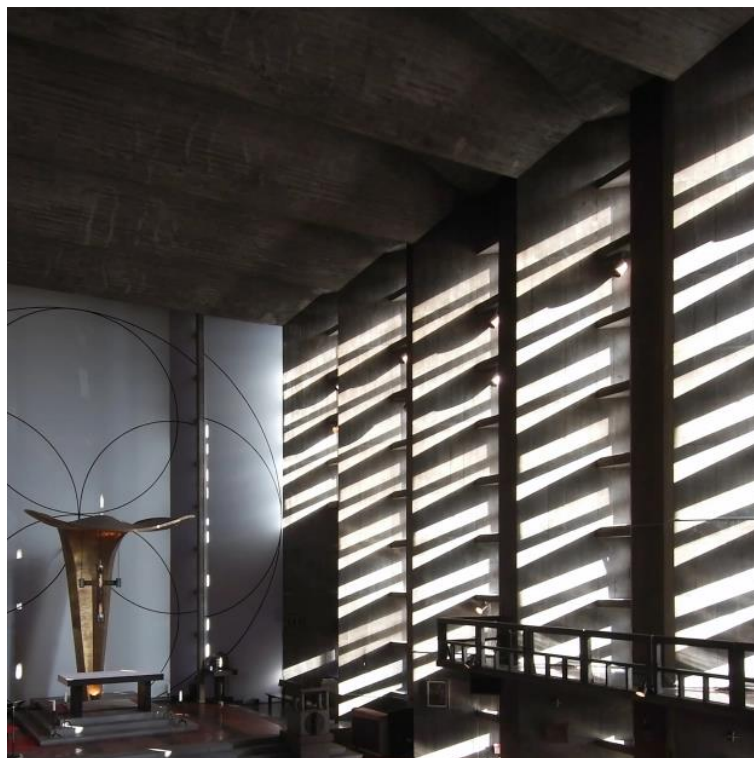
During the war, Antonin Raymond worked in the USA, accepting commissions for the army (some of ill repute, as life-size models of Japanese row-houses to test on them the efficacy of incendiary bombs) and designing houses. In America he was associated with a young Harvard graduate, his Czech countryman and fellow architect, Ladislav Rado.



After the Pacific War, he accompanied the entourage of General MacArthur, being arguably the first Western artist to return to Japan [31].

The Reader's Digest Building, located on the vacant plot of the French embassy, was his initial work of this second period. The building suffered demolition in spite of its surprising modernity. It was the first construction in Japan with central air conditioning, acoustic insulation and integrated lighting. Although the building's seismic stability had been verified by experts, it was questioned by some authorities due to its audacious design featuring a double cantilevered frame [32].

The church of St. Anselm is another poignant work of Raymond. It was commissioned in 1954 by Father Hildebrand who was principal of the Benedictine order in Japan. Raymond worked for several years on the commission and conceived many models. He commented on the project that the result is fruitful due to its advanced structural system and economy [33]. The folded panels that shape the walls and the roof were left exposed in bare concrete with steel sheets. In the longitudinal direction, each side is formed by a folded wall 6 *sun* wide (about 20 cm), and the roof is supported by long beams of 2.7 *sun* (Japanese feet) thickness (about 8 cm). Each zigzag wall portion is embedded with concrete beams to create a rigid portico that supports the deck loads and the transverse mechanical stresses caused by earthquakes (Figure 18) [34–36].



**Figure 18.** Staggering walls embedded with beams in the church of Sei Anselm. Source: authors.

After such acclaimed work, which still had a touch of foreign spirituality, more churches followed in due course, such as Saint Alban, an Anglican Episcopal temple in which Raymond drew on timber frames encompassing the tradition of Nipponese temples at the risk of a more compromised safety against earthquakes [37].

Other important works of the same typology were St. Paul in Karuizawa, the Shibata Catholic Church, and specially St. Michael in Sapporo; in this last case, we have to recognize that quakes are rare in the Hokkaido region where the building is located and thus, timber frames are better suited to the project [38] (Figures 19 and 20). In the supporting truss he displayed some rare and precious articulations of three roll-beams.



**Figure 19.** View of Saint Michael Church by Raymond in Sapporo. Source: authors.



**Figure 20.** Front view of Saint Michael Church. Sapporo. Source: authors.

It could be stated that in a serendipitous way, he seemed to return to his origins in a serene path of spirituality that had deeply overjoyed him in India.

In the final stage of Raymond's residence in Japan, Fusaichiro Inoue, who was a patron of Bruno Taut, commissioned him several relevant works, including his marital house in Nishi-Azabu and the Performing Arts Center in Gunma. Raymond used in this latter building one of the most celebrated cultural venues in the central regions of Honshû, the same anti-earthquake typology that he had applied previously in the church of Sei Anselm. Specifically, folded V-shaped plates in concrete both for the roof and the walls, forming a continuous portico which even accommodates Kakubi and Noh performances (Figure 21) [39]. In this case, for acoustic and visual reasons the plan is divergent. Interestingly, a very similar idea was adapted by the Uruguayan architect Eladio Dieste in the Church of Atlantida, although in this case by employing reinforced brick masonry and curved forms, which little by little were discarded in Raymond's oeuvre except for the chapel of the Nanzan University in Nagoya [40,41].





**Figure 21.** Folded V-shaped concrete sheets in the Performing Arts Center in Gunma, Japan. Source: authors.

## 6. Conclusions

Antonin Raymond produced a real advance in sustainable architecture due to his experience and adequate management of architectural issues and in the wake of the enculturation that he had undergone over many years. He achieved a long sought-for attunement between oriental and occidental architectures, creating at the same time new kinds of building typologies that were completely developed.

He realized the potential of the Japanese understanding of nature in the contemporary architectural scene and felt at ease with its intelligent pursuit in search of a renewed place in the international scene. On this matter, Antonin Raymond had argued: “An architect working in Japan has the basic principles, whose re-discovery lies at the essence of modern architectural trends” [2] (p. 150).

In truth, he dealt with a complex and refined culture, which stayed apart from all other civilizations in a movement called *Sakoku*, in open defiance to the common and fashionable principles that the west had firmly settled in architectural production, as it came manifest in many realizations.

In Japan, scholars have detected an enduring respect for the natural sphere which has modelled manifold aspects of human activities and arts and Raymond was capable of transporting this to the architectural ways. Consequently, Japanese tectonic modes, so encircled, are singular and sustainable in a consuetudinary fashion. Raymond seems to have anticipated the ideas in Alexander’s *A Timeless way of Building*, as he realized of the significance of nature for the Nipponese mind: an unfathomable treasure of creative stints from which to extract a repertoire of inventions suitable for architectural expression.

Initially he had pioneered the use of reinforced concrete with a “natural nuance” through, for instance, special resilient scaffolding, since wooden buildings could not withstand earthquakes and fire, but almost in parallel he endorsed the revamping of timber-frame typologies when a more intimate atmosphere was required. He advanced on this latter notion throughout his career.

For all the former, we firmly believe that Antonin Raymond remains pivotal to Modernism and the contemporary architectural scene since he not only had worked directly with the American master Frank Lloyd Wright but also acknowledged the influence of great European referents, such as Le Corbusier and Auguste Perret, although at a later stage he admitted with some deceit that Corbusier was not really interested in Japan [42,43]. His revolutionary approach consisted in a hermeneutics of the Japanese ways (*Dao*) towards

the built environment and suburban landscape that could be effectively incorporated to the sustainability of a forthcoming architecture. Raymond clearly understood the vernacular as a precedent for solar and later sustainable architecture, as we have tried to demonstrate with several above examples. His merits reside in making happen the fusion of American and European architectures, precisely in Asia; of the three continents, the one with more ancient civilizations by large.

Famous living architects and architectural thinkers, Ando, Ito, or perhaps Tange and Kurokawa, might as well be included in his wake, such is the stature of intellectual legacy [44]. Most importantly, he established the precedents by which today's juggernaut building industry in Japan has evolved in subsequent steps towards maturity following aptly his trail and procedures towards sustainability.

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