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# For Everyone a Sky Garden

## 每个人都能拥有的空中花园



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Jaron Lubin joined Safdie Architects in 2004 and became a Principal in 2012. He has led several key projects alongside Moshe Safdie, including a recent proposal for the National Art Museum of China in Beijing. He is currently the project designer of Sky Habitat, a new high-density condominium complex in the center of Singapore. Previously, he was a member of the competition-winning design team for the Marina Bay Sands integrated resort; he relocated to Singapore to oversee work on the project, most notably as the resident design architect for the SkyPark

雅龙·鲁宾于2004年加入萨夫迪建筑师事务所并于2012年成为该所的董事。他曾与摩西·萨夫迪一起领导了几个重点项目，其中包括近期向北京中国国家美术馆提出的方案。目前，他是天空人居 - 一个位于新加坡市中心的全新高密度共管式公寓综合体 - 的项目设计师。之前，他是新加坡滨海湾金沙综合度假胜地得胜设计团队的主要成员之一；他曾被委派到新加坡负责监督该项目，其中主要担任空中花园 驻场建筑设计师一职。

### Abstract

A key principle of Moshe Safdie's work over the last four decades has been to develop livable collective spaces within dense urban environments. Beginning with his seminal Habitat '67 in Montreal, Safdie proposed 'a garden for everyone,' a fractal-shaped structure of pre-fabricated housing unit blocks, stacked to maximize openness and views, bring in streaming natural daylight, and to position an individualized 'home' within a community. More recently, Safdie's Practice Safdie Architects has developed principles for high-rise, mixed-use developments around the world, and specifically in Asia, where they build upon both past experience as well as a continued research practice within the office. Using five of the firm's recent works as case studies, this paper shares both technical breakthroughs and proposed conceptual frameworks for collective public spaces within tall high-density, mixed-use structures.

**Keywords: Sky Garden, High-Density, Mixed-use, Megascale, Vertical Greenery**

### 摘要

在过去四十年的作品中，摩西·萨夫迪以为密集的城市环境提供宜居的集体空间为其主要设计理念。由位于蒙特利尔影响深远的人居 '67开始，萨夫迪提出了「一人一园」的概念，以预制住宅单元体块不规则的堆叠方式最大化开放空间和景观，将自然光渗透其中，也同时把每个「家」融入群体。最近，萨夫迪的设计团队萨夫迪建筑师事务所把这些主要的设计理念带进世界各地的综合用途高层住宅当中，项目遍布全球，尤以亚洲为主。团队的创作基于继往开来的专业经验和持续的研究。本文将五个近期作品作为案例，分享其中的技术性突破，以及高密度高层综合建筑中集体公共空间的概念框架。

**关键词：空中花园、高密度、综合用途、巨型尺度、垂直绿化**

### Building upon Moshe Safdie's Habitat in Modern Day Asia

Moshe Safdie wrote 'For Everyone a Garden' referring to his iconic Habitat '67 project in Montreal, Canada. Habitat was designed as a fractal-shaped structure of pre-fabricated housing unit blocks, stacked to maximize openness and views, bring in streaming natural daylight, and to position an individualized 'home' within a larger community. Most importantly, each unit of Habitat had its own private roof terrace garden. To live with a garden, Safdie fundamentally stated, was a paramount and primeval human desire that was required to be satisfied (see Figure 2).

The mission of Habitat was to identify a type of urban living that transcended what Safdie called 'the decades-old malaise associated with apartment living,' and provide amenities and an environment not typically matched to urban life. Habitat's high goals were to replace vertical glass and steel apartment blocks with a new fractalized language of stacked and stepping boxes and to develop livable collective spaces within dense urban environments. The building was the exciting central exhibit pavilion of the 1967 Expo and represented the utopian optimism of the day (see Figure 1).

### 在现代亚洲建筑在摩西·萨夫迪人居理念之上

摩西·萨夫迪所写的“一人一园”乃依据其位于加拿大蒙特利尔极具标志性的人居 '67。人居的设计是以预制住宅单元体块不规则的堆叠方式最大化开放空间和景观，将自然光渗透其中，也同时把每个“家”融入群体。最重要的是“人居”的每家每户都拥有私家的屋顶平台花园。萨夫迪从根本上指出，居于园是首要和基本的人类欲望，需要得到满足。

“人居”的使命在于发崛一种新的城市居住形态以超越“数十年来公寓住宅带来的负面感觉”，并提供与一般城市生活不同的配套设施和环境。“人居”的最终目标是在密集的城市环境当中，以崭新的不规则语言，堆叠退台式体块取代竖向玻璃/钢公寓盒子，提供宜居的集体空间。该作品是1967年世界博览会让人激动的中心展馆，代表了那个时代的乌托邦乐观主义（图1）。

在世博会之后，萨夫迪把“人居”的设计提议到不同的环境背景中，包括耶路撒冷、罗切斯特、波多黎各、德黑兰、巴尔的摩等地，但最终都没有建成。“人居”虽然备受全球关注并且具有与不同城市地段相适应的能力，但它的“居住”成本不能和遍地都是的垂直叠拼塔楼式建筑类型竞争。“人居”的几何关系导致建构的低



Figure 1. The original Habitat Proposal 1964 proposed a mix of uses including hotel, office, gallery, department stores and retail.

图1. 最早的1964年人居提案，综合用途包括酒店，办公，画廊，百货和零售店。

Following Expo, Habitat projects were proposed by Safdie, in a variety of contexts, in Jerusalem, Rochester, Puerto Rico, Tehran, Baltimore, and elsewhere, but none were ultimately realized. The cost 'of Habitating' so to speak, despite its global appeal and ability to adapt to various different city sites, could not compete with the more ubiquitous vertically stacked tower typology. The geometry of Habitat made for less efficient structure and challenged the mechanical systems. The multiplication of the surfaces found in the geometric systems of Habitat meant more complicated façades with additional surface area. The density of the schemes could not match the efficiencies of a more standard tower form. Habitat was also by definition more difficult to build and more expensive to operate. While the ideal of Habitat made it an instant architectural and cultural icon, the economics limited the dream of its mass replication.

But the goal of Habitat was that it would respond to the wider demand of affordable housing in the city. In order for it to proliferate, it would need to be studied further. Over the last forty years of Safdie's practice, each institution and building designed has recalled in some way, a search for the Habitat ideal.

### Sky Parks and Gardens

More recently in 2003, Moshe Safdie and his practice Safdie Architects launched a Research Fellowship Program. The goal of the practice-oriented program was to study topics outside the normal business practice constraints so as to develop unique solutions to commissioned works. Since the concept of roof gardens, skyparks, and hanging gardens has been a central theme to the practice and to the firm's philosophy since its inception, it is no surprise that the first fellowship studied tall, bridging buildings, while a subsequent research topic aimed to revisit and rearticulate the objectives of the original Habitat project. This design-research work continues to inform current building projects, in particular in Asia, where work is underway in Singapore, China, and India.

In the first research fellowship, tall buildings were explored in detail, specifically in regards to the study of collective public spaces within high-density, high rise, mixed-use structures (see Figure 3).

The proposals that emerged stacked a variety of uses— office, residential, public, and private spaces— within point tower building forms. Habitat '67 connected its stacked homes with elevated 'streets' which double as common spaces for the residents. Similarly, bridging



Figure 2. Habitat '67 garden terraces

图2. 人居'67花园平台

效率，也同时让各种机械系统受到挑战。“人居”的设计当中包含许多外表面，意味着复杂的外墙设计和额外的表面面积。设计密度也比不上标准塔楼的效率。“人居”本身兴建困难而且运作费用也相对较高。虽然“人居”的理念让它立即成为建筑和文化界的图标，但各种经济因素使推广“人居”的梦想大受限制。

但“人居”的目的是对在城市之中可负担住房的广泛需求作出回应。要推广它，进一步的研究是必须的。在萨夫迪以往四十年的专业生涯当中，每一个建筑设计在某种程度上，都是对“人居”理想的进一步探索（图2）。

### 空中园林和花园

2003年，摩西·萨夫迪和他的专业团队萨夫迪建筑师事务所发起了一项研究奖学金计划。此实习性质的研究计划目的在于研究正常商业活动限制以外的诸多课题，以便对委托项目提出更独特的设计方案。由于屋顶花园，天空园林，和空中花园从创立以来都是萨夫迪设计团队和事务所的中心主题和理念，以高层天桥住宅楼宇作为研究计划的第一项目是理所当然的。随后的研究课题意在重新研究及重新表述“人居”最初的目标。此设计-研究工作持续影响着当前的建筑项目，尤其在亚洲各地如新加坡、中国和印度。

在第一个研究计划中，我们对高层楼宇的细部进行了深入探索，尤其是高密度高层综合建筑中的集体公共空间(图3)。

随后呈现的方案在点式塔楼原型中堆叠了多种用途—写字楼、住宅、公共和私密空间。在“人居'67”中堆叠的住宅体块以空中“街道”相连，这些“街道”也同时成为住户们的共享空间。类似地，通过简单的水平连接，以天桥间歇地分割高塔创造出空中社区。这些天桥把各个功能分区和系统组织起来，将绿化空间融入结构之中，加强了安全疏散和流动性，同时创造出多个远眺城市的新视点。

与研究成果出台同时，萨夫迪建筑师事务所被邀请参加新加坡的一个全新综合度假项目的设计竞赛。这个占地10,000,000平方英尺（约930000平方米）的项目包括了3000间酒店客房，赌场，会展中心，超过一百万平方英尺的零售商铺，长廊和一个作为“标志性元素”的滨海湾岬—后来被设定为艺术科学博物馆。



Figure 3. A speculative research proposal for linked tall buildings at the Con Edison Site along the East River in New York City.

图3. 研究提案 - 沿纽约市东岸CON EDISON基地上的一个链接的高层建筑

high-rise towers at intermittent levels created neighborhoods in the sky via simple horizontal communication. The bridges tied the program and systems together, integrated green spaces within the structures, enhanced secure egress and mobility, and created new vantage points from which to view the city.

Coincident with the conclusion of the study, Safdie Architects was invited to participate in a design competition for a new integrated resort project in Singapore. The 10-million-square-foot (approx. 930,000sm) program brief included 3,000 hotel rooms, a casino, a convention center, more than a million square feet of retail, promenades and 'an iconic building element' on the Marina Bay Promontory, which would ultimately be conceived as the Art Science Museum.

While a single vertical tower was allowable by zoning restrictions and the preference of the developer, it would create a formidable wall condition on the site, and ultimately block the view from the Downtown Central Business District to the ocean beyond. It was decided to proceed with three buildings, set back from the edge of the waterfront site, the gaps between the sloping blocks reading as large 'urban windows' to the sea (see Figure 4).

The invention of the SkyPark, the nearly 2 hectare garden which crowns the three hotel towers and whose form cantilevers asymmetrically 66 meters to the north, was as much a reaction to the program brief, as it was a natural evolution of work and preoccupations of the research. The brief had asked for a large swimming pool, jogging tracks, gardens, restaurants, and lounge spaces—amenities one would expect of a large-scale resort hotel. However, it was clear that the space requirements at ground level would make it difficult to locate these elements. The solution was to bridge the towers with the SkyPark. The park's added amenity as a de facto public observation space for Singapore would provide a surreal relationship to the city, setting the horizon line fifty-seven stories below one's feet, with views to Singapore Indonesia, Malaysia and beyond (see Figure 5).

In each of the building projects, Safdie Architects strives to advance the work the previous project began. To find valid concepts which contribute to the environment in one project and adapt them further to serve the next project in its own context.

In Chongqing, China, a city of 36 million residents, a second large-scale, mixed-use project in Chaotianmen Square weaves towers with mid-height, horizontal elements. A cluster of six slender eighty-storey



Figure 4. Marina Bay Sands Hotel Towers and SkyPark. Garden terraces along the East Face of the building complex. © Timothy Hursley/Safdie Architects

图4. 滨海湾金沙酒店和空中花园. 沿建筑东立面的花园阳台

尽管规划限制允许一个单一的高层板楼,客户也倾向于这种方案,但是由此会创造出一面令人压抑的墙面,最终阻挡从市中心金融区到大海的景观联系。所以我们决定从三座建筑开始,由基地水边退台,倾斜体块之间的空隙成为巨大的海景城市之窗(图4)。

空中园林的发明—近两公顷的花园,悬浮在三座酒店之上,不对称地在北面悬挑出66米—不但是对项目本身功能的反应,也是研究工作和思考的自然演变。任务书要求一个巨大的游泳池,慢跑路线,花园,餐馆和休息空间—大尺度休闲度假酒店应提供的配套设施。但是,在地面很难安排这些元素。解决方案是以一道空中园林连桥横跨三座塔楼。空中公园增加的功能,作为新加坡的新焦点公众观景平台,提供了一个与城市之间的超现实关系,将城市水平线设定在57层楼之下,远眺印度尼西亚、马来西亚及更远区域(图5)。

在每一个建筑项目中,萨夫迪建筑师事务所都致力于在前一个项目的基础上更上一层楼。在一个项目环境中寻求适宜的概念,在另一个项目自身环境中进一步演化发展他们。

中国重庆,一个拥有三千六百万人口的城市;朝天门广场,又一个超大尺度综合用途项目以中部水平元素编织塔楼。一组六个纤细的80层塔楼由一道管状连桥联接在一起。在滨海湾金沙度假项目中,空中花园是分离的,并且很大程度上用于室外空间;而在重庆,大尺度水平元素表现为整体网络系统的一部分。四分之一英里长的玻璃桥“塔”本身就是一个综合用途水平建筑,复制了垂直塔楼的功能,以便更有效地为其上和其下的楼层提供网络化建筑服务。

### 未来人居

为了回应为什么“人居”没有推广的问题,第二个研究项目研究了需求和设计及施工资源之间持续的紧张关系。如何使“人居”在施工上能更高效?如何改良生活环境?如何使之更平价,同时保留人居所承诺的众多配套设施?通过一系列实验项目,设计-研究独立探讨了每一个变量。结果产生了一系列退台和堆叠的建筑类型,实验了各种不同的建筑密度和施工方法(图6)。每一个方案都被赋予了不同的名字,如“多米诺”,“A-框架”,“偏菱形”和“叠膜”(图6)。

北京以东300公里的渤海湾,一个高密度综合用途住宅项目正在秦皇岛施工。这个项目沿沙滩一字展开,32层高,提供了3566个住宅单元。综合体的平面为折叠图案以最大限度地给每一户提供海景。设计创造了一个城市花园环境,由众多的私密和公共空中花园组成。花园和游泳池由连桥承载,桥腹内是LOFT风格高顶住



Figure 5. Aerial photograph of the Marina Bay Sands SkyPark. Foreground cantilever structure is the public observation deck. Gardens and hotel amenities beyond. © Timothy Hursley/Safdie Architects  
图5. 滨海湾金沙酒店空中花园的俯瞰照片。前景悬挑结构为公共观景平台。后景为花园和酒店配套设施。

towers are united with tube-shaped bridge-like elements. While at the Marina Bay Sands, the SkyPark is discrete and devoted in large part to outdoor amenities, at Chongqing, the large-scale horizontal elements are expressed as parts of an overall networked system. The quarter-mile long bridging glass 'tower' is a mixed use building in its own right set horizontally, and duplicates the function to of a vertical building to more efficiently network building services shared by the towers above that look down upon it, as well as those below.

### Habitat of the Future

In response to the question of why Habitat did not proliferate, the second research fellowship studied the continued tension between desire and the resources that were to be found in design and construction. How could Habitat be constructed more efficiently? How might it be improved as a living environment? How could it be made more affordable or more sustainable, all the while maintaining the generous amenities Habitat had promised? Through a series of speculative projects, the design research addressed each variable independently (see Figure 6). The result was a series of stepped and stacked building typologies, testing a variety of building densities and construction logics. Each scheme was given names like 'Domino', 'A-Frame', 'Rhomboid', and 'Stacked Membrane' (see Figure 6). These new 'Habitat of the Future' typologies were quickly embraced and are currently being deployed and further refined for projects in China, Singapore, and India.

Three hundred kilometers east of Beijing on the Bohai Sea, in Qinhuangdao, construction is under way for a mixed use high-density residential project. Organized along a beachfront boardwalk, the complex has 3,566 residential units on 32 floors. The plan form of the complex is shaped in a folding pattern to maximize views from each unit to the ocean. The design creates a city-garden environment, combining numerous private and public gardens in the sky. Bridges carry gardens and swimming pools above, and inside the bridges are loft-style units with tall ceilings made possible by the spanning concrete-encased steel trusses (see Figure 7). As opposed to the typical extruded tower form, the edges of the building are terraced to open to large private garden roof decks, creating a series of stacked penthouses along the full height of the building. The cast-in-place concrete grid structure systematizes the stepping of the form lending



Figure 6. Rendering of the 'A-Frame' research proposal (top), 'In-Out' scheme (middle) and 'Domino' scheme (bottom).  
图6. “A-框架”研究提案（上）、“内-外”方案（中）以及“多米诺”方案（下）渲染图



Figure 7. Three-dimensional diagram of the Qinhuangdao residential project shows building massing and bridging greenery  
图7. 秦皇岛住宅项目三维示意图，显示建筑体量和连桥绿化



Figure 8. Perspective rendering of the level 26 bridge, which has a green landform and sculpture garden alongside common amenities and outdoor lounge areas.  
图8. 26楼连桥透视渲染图 - 沿公共设施和室外休闲区的绿地和雕塑花园

itself to simple and efficient construction, and dedicated diagonal chase-ways within the building were developed to accommodate common service paths for mechanical services .

In Singapore, construction is underway in Bishan, ten kilometers to the north of the Marina Bay Sands site, and surrounded by HDB estates, the vernacular government subsidized block housing provided for Singaporeans. The 12,000m<sup>2</sup> site is adjacent to a major mass-transit hub and surrounded by schools and parks. The client requested 500 units to meet the desired high plot ratio. The strategy for the compact site was to position two thirty-eight-storey towers oriented north-south, staggered so as to avoid overlooking units, and connected by bridges at three levels to create a type of tripartite massing. The spanning open-top bridges carry gardens and swimming pools, within the depth of the truss. As in Marina Bay, these shared amenities recovering the built area on the ground level. The building geometry creates an open air garden atrium facing further amenities at grade. Above, as in Qinhuangdao, the building form steps again with one-third of the units hosting terraces open to the sky, complete with a garden planter and a mature tree (see Figure 8).

Arranging the vertical stepped units as such, the goal to densify the original Habitat system is achieved. Whereas the original Habitat had an FAR of 1.6, Bishan is closer to 4.9, the same density of mid-town Manhattan.

Finally, in Mulund India, just outside of Mumbai, a concept proposal has been developed for 1200 units organized on a site only slightly larger than the one in Singapore; double the density. To provide livable spaces even at this density is a true test of the Habitat of the Future agenda. In Mulund, the building blocks are further regularized to maximize efficiency and constructability. Double-loaded blocks are served by naturally ventilated open corridor bridges. Each stacked block of fourteen floors is shifted one atop the other over deep bridge trusses, which maintains porosity and views through the mega building form (see Figure 9). The bridges in India contain gardens and viewing platforms, while providing refuge floors and multiplied egress paths for fire safety. Vertical cores are arranged to be shared between building blocks to further aid in the efficiency of the building design.

The projects in China, India, and Singapore envision a multiplication of



Figure 9. Concept sketch by Moshe Safdie indicating the proposed building massing for Mulund.  
图9. 摩西·萨夫迪的概念草图，显示穆兰德建筑体量

宅单元,裹混凝土的钢桁架提供了设计的可能性(图7)。与随处可见的标准塔楼不同,本建筑边缘层层退台,不但形成私家屋顶大花园,还沿建筑通高创造了一系列顶层单元。现浇混凝土网格结构系统地组织退台形式,使施工简单和高效,并且,建筑中使用了专用对角管井来容纳公共机械服务。

在新加坡,碧山项目正在施工中,位于滨海湾金沙项目以北10公里,被HDB住宅区一由政府资助提供给新加坡人的体块住宅一所包围。碧山项目基地12000平方米,毗邻一个主要交通枢纽,并由学校和公园环绕。客户要求500单元以满足期望的高用地效率。我们的设计策略为在紧凑的用地设计上设计两栋38层南北向塔楼,错位布置以保证上下住宅单元在视觉上的私密性,由三个位于不同高度的连桥连接形成三分体量。横跨的开敞连桥上载有花园和游泳池,嵌在桁架之中。像在滨海湾金沙项目中一样,这些共享的配套设施重新找回失去的地面绿地。建筑几何造型创造了一个面对地面设施的开敞的花园中庭。其上,如秦皇岛项目,建筑造型再次退台,使1/3的单元拥有私家露台,花坛和一棵成熟的树(图8)。

如此安排垂直退台单元,达成了加密原始“人居”系统的目标。原始人居系统的容积率为1.6,而碧山项目为4.9,与曼哈顿中城密度相同。

最后,印度穆兰德,孟买以外不远,在一个比新加坡项目稍大的基地上,我们设计发展了一个1200单元的住宅项目概念;并且密度加倍。在这个密度上设计可居住的空间对未来人居是一个真正的考验。在穆兰德,建筑体块被进一步规律化以最大限度提高效率和可建设性。自然通风的开敞廊桥为双面走廊。每个堆叠的14层体块相对于其它体块都在孔状桁架处移位(图9)。此印度项目的天桥载有花园和观景平台,并提供避难层和多重安全疏散通道。垂直核心筒的位置使之可以被上下建筑体块共享,进一步提高建筑设计的效率。

中国,印度和新加坡项目的设想是增加地面街道体验;它们在建筑中部用空中开敞连桥提供相互联系,并且将绿地有机地整合于建筑之中。地面花园和空中花园使住户受益匪浅,这些半公共空间是家庭聚会,邻居聊天和孩子们玩耍的场所。每一个项目都在打破建筑尺度,通过退台和错位来表达每个家宅。这些都是使高密度高层城市环境人性化的关键策略。

随着亚洲巨型城市继续快速增长,人口急速增加,他们将会继续挑战个人建筑环境的尺度。在本设计研究实践中,在这些正在施工中的项目上,萨夫迪建筑师事务所将继续沿用40多年前播种的主题,重新塑造以人为本的高密度住宅,并通过建筑和城市设计推进社会融合。再次回顾人居,我们清楚的认识到,建筑的经济性与高品质的生活可以并存。

the ground-level street experience; they interconnect the mid-levels of the building with elevated open-air bridges, and integrate greenery within the building. The gardens at grade and the sky gardens in the air benefit the residents immensely embedding semi-public spaces where families can gather, neighbors can chat, and children can play. Each project also breaks down the scale of the building articulating the individual home via their stepped and staggered building forms. These are key strategies developed to humanize the dense scale of the high-rise urban environment.

As Asian megacities continue to rapidly grow and intensify populations, they will also continue to challenge the scale of the individual related to the built environment. In the design-research practice undertaken, and the projects currently in construction, Safdie Architects continues to build on the themes seeded more than forty years ago, to re-imagine high-density housing for the individual and to promote social integration through architecture and urban design. In revisiting Habitat, it becomes clear that, today, it is possible to build economically without sacrificing a high quality of life.

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