CTBUH Journal

International Journal on Tall Buildings and Urban Habitat

Tall buildings: design, construction and operation | 2011 Issue I

Marina Bays Sands, Singapore

Origin of the Skyscraper

World's Tallest Steel Shear Walled Building

Tall Timber Buildings

Dimensions of Density in Hong Kong

2010: A Tall Building Review

Talking Tall: Ups and Downs in Russia

Council on Tall Buildings and Urban Habitat

This Issue

Published by
The Council on Tall Buildings and Urban Habitat

ISSN: 1946-1186

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Print
This Journal is printed by Source4, Chicago.

Front cover: Marina Bay Sands, view from the north.
Back cover: Marina Bay Sands, hotel lobby.
© Safdie Architects

On reviewing the papers for this Journal, I noticed with some interest that the case study on Singapore's Marina Bay Sands (see page 12–17) introduces the project as a new and yet nameless type of tall building. A language as versatile as English should have no problem coining a new word for this, but I guess of more importance is whether the new name will stick. Is this new building type a one-off or is it here to stay?

The CTBUH has been the stage for new skyscraper names before. During the 2009 Chicago Conference, architect Eric Kuhne introduced the term "starcatcher" to label the 1,001-meter tall Burj Mubarak Al Kabir project in Kuwait. Another height-related label is the subject of a Global News article in this Journal issue, discussing the large number of recent tall buildings in China. While the term "supertall" refers to the 300-meter (1,000-foot) height threshold, the term "megatall" is making its way into popular culture as an indicator of tall buildings over the 600-meter (or approximately 2,000-foot) threshold. Coincidentally this Journal also has a paper on the origins of the skyscraper (see page 18–23).

"Supertall" and "megatall" define tall buildings by their height in an age where buildings are growing ever taller and taller. Another development refers to tall buildings, or even groups of tall buildings, which don't stand out because of their vertical prominence, but more so because of their horizontal development. Last year's overall CTBUH Best Tall Building winner – the Linked Hybrid Complex in Beijing, and this year's winner for the Best Tall Building Asia & Australasia region – Singapore's Pinnacle @ Duxton, are great examples of both the relationship tall buildings are establishing with their horizontal environment, and the social environments which are created. The Marina Bay Sands, Singapore case study in this Journal is further evidence of the trend.

When I look at the results of various tall building studios around the world I see another emerging trend towards remarkably "open" skins, as if these buildings are trying to open up to the city that surrounds them. I think this is a very positive development and I really hope that the students of today will be able to realize their ideas as the architects of tomorrow.

Looking at these developments, then, I think we are witnessing the birth of a tall building type which doesn't just scrape the sky. Perhaps more in common with the already-familiar term "groundscraper" (as a building or podium that extends its horizontal connection with the ground), I see buildings that are trying to open up to the city on all levels. Maybe in the future we will call these buildings cityscrapers or urbanscrapers. Whatever their name will be, it is exciting to see the tall building again being a frontrunner in the way we shape our cities.

With these new developments ahead, and this being the first Journal issue of the new year, you will also see several positive developments and new features that we are introducing into the CTBUH Journal from 2011 onwards. One is the new *Debating Tall* article where two opposing views on one topic are presented (see page 5). Another is the new *Design Research* section, where we showcase the work of a tall building academic studio from a university around the world. And a third is *CTBUH on the Road*, where you will find an overview of some of the external activities of the CTBUH from the preceding quarter. These changes are part of a constant effort to improve the Journal as the world's leading platform on tall buildings and urban habitat. So whatever 2011 brings in the world of tall buildings, you can be sure you will read about it here.

Best Regards,

Sangdae Kim

Sang Dae Kim, *CTBUH Chairman*

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*Visit **www.ctbuh.org** for more on the global tall building industry and the Council on Tall Buildings and Urban Habitat*

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"The modern skyscraper is generally considered to be an American invention. Both Chicago and New York claim they once hosted the world's first skyscraper…"

Gerard Peet, page 18

Global News

The CTBUH Global News Archive is an online resource for all the latest news on tall buildings, urban development and sustainable construction from around the world. For comprehensive industry news, visit the Global News Archive at: ***http://news.ctbuh.org***

China

Almost every other day there's a voice from the corner of the CTBUH office saying out loud: "Got another one!" That would be CTBUH Database Editor Marshall Gerometta each time he discovers a (super)tall building that has been proposed or broke ground somewhere in China. In the last three months alone, 63 buildings over 150 meters in height (approximately 500 feet) have come to light as proposed projects or skyscrapers under construction.

Currently there are two projects over 600 meters (almost 2,000 feet) under construction in China: the 632-meter (2,073-foot) tall Shanghai Tower and the Pingan International Finance Center in Shenzhen. The latter has not released an official height figure yet, though reliable sources say it will be well over 600 meters. In the past several months, more proposals for skyscrapers over 600 meters have been announced for the cities of Chongqing, Guangzhou, Dalian, Zhuhai, Nanning and Wuhan.

The exact details on those projects are not yet known. "It is not easy to get information from China; so these figures, which are already impressive, can be considered conservative numbers," says Gerometta. "Incidentally, you normally don't even find out about a Chinese skyscraper in most of the world until it has been completed. My tallest personal example of that is the World Trade Commerce City in Nanning. It's a 218-meter (715-foot) tall building which was completed in 2006. In all but 83 cities of the world, a building of that height would be the tallest building in the city. In China, its completion almost goes unnoticed."

Baietan Tower urban plan, Guangzhou, China © Skidmore, Owings & Merrill/Crystal CG

A potentially tall development has been unveiled as part of the **Baietan Urban Design Master Plan** in **Guangzhou**. The Baietan Tower is the signature tower of a new business district which is to become Guangzhou's International Commercial Center. The SOM-designed Master Plan envisions a city with over 740,000 residents and 660,000 jobs, situated on former industrial land on the banks of the Pearl River in central Guangzhou.

Also proposed, according to Chinese sources, is the second phase development of the **Longemont Asia Pacific Center** in **Shenyang.** This tower, which is projected to be 430 meters (1,411 feet) tall, is following the first phase construction of two towers at 235 meters (771 feet).

...chimneys

> "Tall buildings naturally act as chimneys. There is a natural draw of air that, up until now, we've had to fight."
>
> *Mustafa Abadan, SOM Design Partner, about Digital Media City Landmark Tower, Seoul. From "Jolly Green Giant," Eco-structure, November/December 2010.*

Tianjin R&F Guangdong Tower, Tianjin, China © Goettsch Partners

Canton Tower, Guangzhou, China © Information Based Architecture

Golden Dream Bay, Qinhuangdao, China © Safdie Architects

20 Fenchurch Street (the Walkie Talkie), London, UK © Land Securities

Chinese developer Guangzhou R&F Properties has commissioned a new 294,570-square meter (3.17 million-square foot) mixed-use tower in the city of **Tianjin.** Occupying a central parcel in the city's newly planned business district, the **Tianjin R&F Guangdong Tower** will be one of China's tallest buildings at 439 meters (1,440 feet). The complex, designed by Chicago-based Goettsch Partners, features 134,900 square meters (1.45 million square feet) of office space, a five-star hotel with 400 rooms, 55 condominiums, and 8,550 square meters (92,000 square feet) of retail space. Tianjin R&F Guangdong Tower is scheduled for completion in 2015.

While new towers are being proposed, projects are also being completed. In **Guangzhou**, the **Canton Tower**, which was previously known as the Guangzhou TV & Sightseeing Tower, became operational on September 29, 2010. With its completion, it takes the title of the World's Tallest Freestanding Tower, surpassing the CN Tower in Toronto, which held that title since its completion in 1976. The 610-meter (2,001-foot) tall Canton Tower, which is designed by Mark Hemel and Barbara Kuit of Information Based Architecture, is also a signature project of the 2010 Asian Games. It contains numerous viewing platforms, sheltered outdoor gardens, and two circular rotating restaurants.

The author of the case study in this issue of the CTBUH Journal, Moshe Safdie, recently announced that his company had won a competitive bid to design **Golden Dream Bay**, a residential and retail complex of multiple towers in **Qinhuangdao**. This project is yet another example that tall buildings are becoming increasingly interesting, not only because of their height, but even more so in their horizontal and social development. The project provides housing for the city's growing population, while maximizing access to gardens and light at every level through the use of large-scale windows throughout the structure. Shared amenities and public spaces foster a sense of community among residents. The site encompasses a total building area of 557,400 square meters (6 million square feet) divided over four main complexes. Next to 2,200 residential units, the whole project includes 6,800 square meters (73,000 square feet) of retail space and 6,900 square meters (74,000 square feet) of recreational clubhouses.

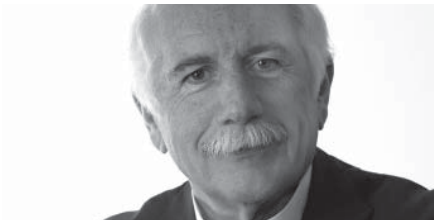
United Kingdom

In the Global News of CTBUH Journal 2010 Issue IV, we discussed a revival of British tall building developments in the wake of the global financial crisis. The last quarter saw plenty of conformation of this development, with a number or projects being revived or announced.

One of the most well known projects which saw its development status officially changed recently from "on hold" to "under development" is the **Leadenhall Building** in **London** which, because of its tapering shape is also known as the Cheesegrater. The 225-meter (737-foot) tall project, first presented in December 2003, was revived after developer British Land agreed with Canadian-based Oxford Properties to develop the Leadenhall Building on a 50:50 joint venture basis. The total development cost is expected to be around £340 million. Completion is expected in 2014.

In October, Land Securities teamed up with the Canary Wharf Group to start constructing the 160-meter (525-foot) tall **Walkie Talkie**

Case Study: Marina Bay Sands, Singapore



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Moshe Safdie
Moshe Safdie is a leading architect, urban planner, educator, theorist, and author. Embracing a comprehensive and humane design philosophy, Safdie has been a visionary force in architecture and urban planning for over forty years. Safdie is committed to architecture that supports and enhances a project's program; that is informed by the geographic, social, and cultural elements that define a place; and that responds to human needs and aspirations. Completing a wide range of projects, such as cultural, educational, and civic institutions; neighborhoods and public parks; mixed-use urban centers and airports; and master plans for existing communities and entirely new cities, Safdie has made lasting contributions to the quality of life in cities and neighborhoods around the world.

...link

"Today, we design tall buildings as mixed-use communities, and we link them to transit and parks. The way that we conceive tall buildings is an important part of contributing to urban vitality and reducing sprawl."

Peter Weingarten, Gensler, on how to make supertall buildings more sustainable. From "Can Super Tall be Super Green?," www.gensleron.com/cities, November 16, 2010

"While a skyscraper can be defined as a tower that primarily stands out for being tall, Marina Bay Sands is an example of a new and yet nameless type of tall building. The building has broke away from the conventional model of a mega-hotel and integrated resort and in doing so, defined both a new typology and a new icon for Singapore."

Marina Bay Sands is a 929,000-square meter (10 million-square foot), high-density and mixed-use integrated resort complex that brings together a 2,560-room hotel, a 120,000-square meter (1,292,000-square foot) convention center, a shopping mall, an Art & Science museum, two Sands Theatres, six restaurants, and a casino. It is located in Marina South, a peninsula of land reclaimed from the sea in the late 1970s across the bay from Singapore's Central Business District. Conceived as not just a mere building project, but as a city microcosm rooted in Singapore's culture, climate, and contemporary life, the project anchors Singapore's waterfront, creating a gateway to Singapore, and providing a dynamic setting for vibrant public life (see Figure 1).

Figure 1. Marina Bay Sands in the context of the bay

The Emergence of the Urban Window

With a program of nearly 2,600 hotel rooms, the most efficient massing would have resulted in a monolithic and wall-like building. Due to its prominent location within Marina Bay in Singapore, it was decided that three towers would be created instead of one. Each concrete tower hotel is designed at a height of 55 stories. Spanning across the top of the three towers is a 1.2-hectare (3-acre) SkyPark, a new type of public space, framing large "urban windows" between the towers. From the downtown area, framed views of the sea are created, and from the sea, a new city gateway is viewed.

At 200 meters (656 feet) above the sea, the SkyPark spans from tower to tower and on one side cantilevers 66.5 meters (218 feet)

Figure 2. Hotel Lobby

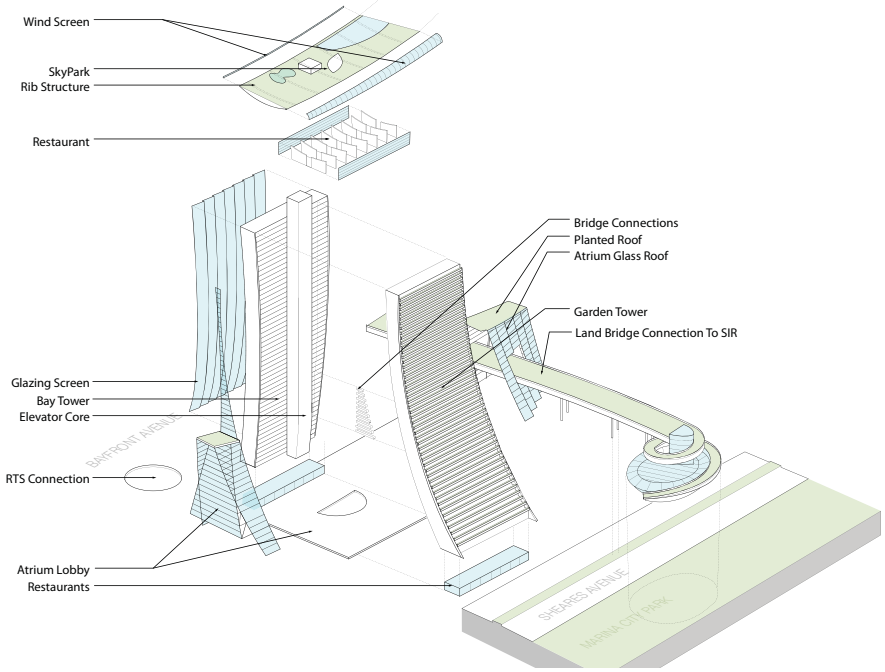

Figure 3. Diagram of Hotel Components

beyond. Longer than the Eiffel Tower is tall, and long enough to park four and a-half A380 jumbo jets, the SkyPark accommodates a public observatory, garden spaces, a 150-meter (495-foot) long infinity swimming pool, restaurants, jogging paths and offers sweeping panoramic views – a formidable resource in a dense city like Singapore. Lavishly planted with trees, the SkyPark celebrates the notion of the Garden City that has been the underpinning of Singapore's urban design strategy.

Design Concept

Conceptually, each tower is composed of two slabs of east and west-facing rooms. The double-loaded towers spread at the base forming a giant atrium at the lower levels, and converge as they rise (see Figure 2). The tower slabs also give further character to the massing and relate to the site context: the glazed west side faces the city center while the east side is planted with lush bougainvilleas facing the botanical gardens and ocean beyond. In plan, as the parcel varies in width, the cross section is decreased from one tower to the next. The three void spaces are connected by one continuous and conditioned glazed atrium, filling the space between the towers with restaurants, retail spaces, and a public thoroughfare. Each tower slab form is also twisted slightly in relation to its pair, creating a dance-like relationship between the two parts and accentuating the slenderness of the buildings, resulting in the appearance of six towers, rather than three (see Figure 3).

Façades

As the largest amount of heat gain occurs on the west façade, it was of paramount importance that an innovative solution be developed to maintain energy efficiency, without limiting the view from the hotel rooms to Singapore's downtown.

The design solution proposed and implemented was a custom double-glazed unitized curtain wall. The energy efficient double-glazed units rest in a frame suspended from the edge of the slab. Perpendicular to the façade, glass fins were installed to provide shading. The outer skin follows the natural curved shape of the buildings, and the use of reflective glass creates a taught mirrored façade. One of the keys to achieving this aesthetic was a minimal spandrel panel at the floor slabs (350 millimeters/13.8 inches), with a continuous double-glazed unit spanning the full 3 meters (10 feet) floor to floor. The glass fins are suspended out of the horizontal stack joint in order to allow them to radiate out in elevation. They are supported by a 3-sided aluminum frame, with the forward edge exposed, which catches the light of the sun, as well as reflections of the façade, to create a unique effect. The fins use a 30% reflective glass and are responsible for shading the façade for up to 20% of all solar gain (see Figure 4).

The east façade handles heat gain differently, utilizing deep planted terraces which follow the sloping radial geometry of the building's profile. The planters help to create microclimate cooling, and the deep overhangs of the balconies naturally shade the hotel rooms from direct sun. Each planter, filled with bougainvilleas, will in time cover the majority of this eastern façade.

The SkyPark

In addition to the 0.9 million square meters (9.6 million square feet) of built space, the project program also called for the development of extensive exterior gardens with

The Culture of Compactness: Dimensions of Density in Hong Kong

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...550

"If we did that with the Willis Tower, we could do it with the 550 other buildings in the Loop."

Gail Borthwick of Adrian Smith+Gordon Gill Architecture, on greening and modernization plan of Chicago. From "The Rise of Retrofit," Greensource, November/December 2010.

"Compact cities are, by their nature, relatively sustainable, and Hong Kong is eminently so on many counts. In addition, the emerging intervention of economic forces in the Pearl River Delta continues to superimpose a new collective identity on the region, and is therefore helping to re-fashion both the physical and economic aspects of the city itself."

Western cities have for long nurtured a realm of formal building elements and spatial configurations, including their urban skyscraper enclaves, that until comparatively recent times distinguished Western concepts of urban design from the less permanent and more spontaneous Asian city values. Rem Koolhaas has referred to the "culture of congestion" with regard to New York but more to the point he has astutely described Asian cities as embodying an equally pertinent signature – a tenuous quality of unrest which makes previous configurations expendable, but also each future state provisional. This sums up Hong Kong very well. Wherever we look, this Special Administrative Region of the People's Republic of China, which occupies only 1,000 square kilometres (386 square miles), is marked by continuing transformation and change. Impermanence underlies its essential urban design language. This is manifested by substantial economic as well as cultural shifts, often representing new and different values superimposed on long established patterns. The representation of urban place is also open to radical change through the make-up and disposition of new spatial types.

During the course of the 20th century, instruments of development policy have been largely based on reconciling the aspirations of a growing population with the often critical shortfall of land and accommodation. In the earliest days of the city building process, government laid down certain ground rules that, while being extended and refined over the years, still influence the form of development – the use of land, sold at auction, as a significant source of government revenue. This, together with a generally laissez-faire economic system has had a significant impact on planning directions. Flexible land-use zoning and successive amendments to the Buildings Ordinance in response to development pressure, particularly in the 1960s, inevitably paved the way for the physical transformation of Hong Kong's urban area into a high-rise city. This has had a clear impact on urban texture – the redevelopment of early 3-story shophouses into six to eight-story blocks was followed in turn by redevelopment of these into multi-story tenements, and then even taller point blocks.

Under Hong Kong's market-driven approach, actual city building objectives are elusive, and it is difficult to stand back at any one time and recognize a situation of "completeness." Due to the new town building programme that commenced in the early 1970s, urban area densities have, for the most part, almost halved, but the morphology of the older urban districts extends well beyond the normal conventions of urban grammar. There is however little firm conceptualization of urban space, which is a cornerstone of western urban design. Thus, new urban configurations contrast yet co-exist with traditional "place" characteristics which relate

more to patterns of activity than physical form. This includes an emphasis on the street for social rituals, ceremonial uses, market trading, open eating areas, and the multi-use of small open spaces (see Figure 1).

The Energizing Ingredients

The expressionism of Hong Kong's older street design for the most part represents an architecture of communication over conceived form. Older street buildings are sporadically and deliberately transformed by their occupiers in a fluid way through personalized building extensions and functional appendages to façades and roofs (see Figure 2), generally on the basis of practicality and immediacy rather than design, with miscellaneous and overlapping functions having few orthodox design credentials. With good urban management, the constant presence of people becomes an essential ingredient for the compact city, energizing activities, minimizing threat, maximising use of public transport, and establishing a ready stream of users for amenities. Inevitably this creates a degree of tension between the complex and interactive working of the city, particularly the need to synchronize certain levels of planning control, with the more indeterminate legacy of informality and spontaneity.

The condensed metro area with its colossal land values and eminently flexible land use zoning, facilitates and perhaps inadvertently encourages a disjointed spatial juxtaposition of independent blocks with little contiguity. Yet these are unified by a kind of parallel universe of informal networks, both physical and electronic. In this situation the uniqueness of "place" is a by-product of the city's essential dynamism where commonalities and interdependencies fashion the very image of the city through an intense range of consumption-oriented services. However, this puts older mixed-use areas on a collision course with economic forces. In some urban districts the value of land is greater than that of the buildings that sit on it. Modern commercial towers require a large floor plate, and redevelopment often means that the fine-grained older quarters are gradually replaced by a more course-grained street matrix.

A Reconstituted Sense of Place

There are now virtually two forms of city character: the first – emblematic of compartmentalization and high-rise efficiency, the second – offering an informal and adaptive response to changing needs and temporary requirements. The first generally embodies a single use complex at a monumental scale, under single ownership or management;

Figure 1. Street vendors

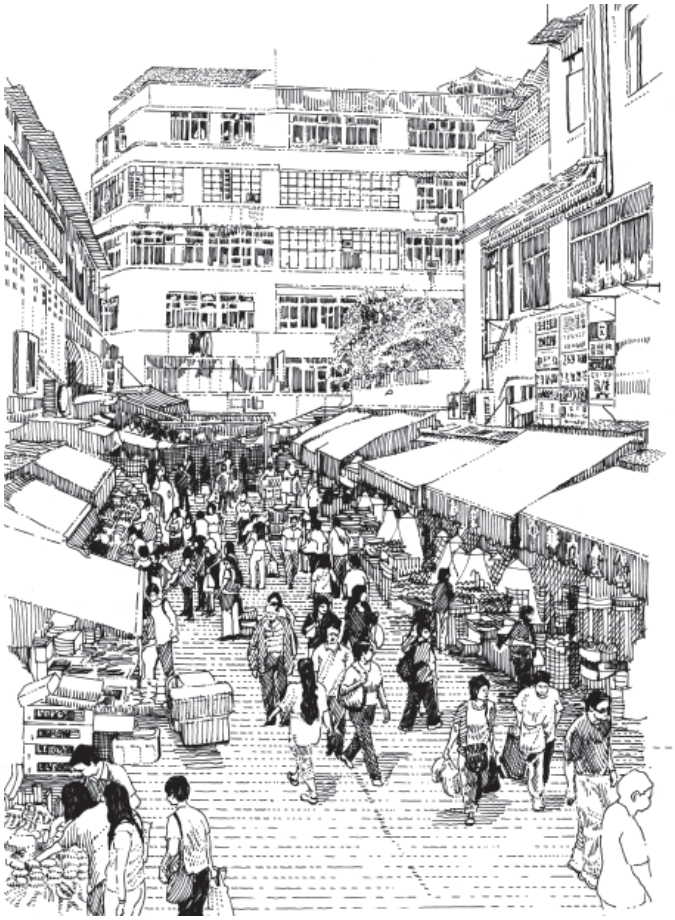

Figure 2. Typical market street in Hong Kong

About the Council

The Council on Tall Buildings and Urban Habitat, based at the Illinois Institute of Technology in Chicago, is an international not-for-profit organization supported by architecture, engineering, planning, development and construction professionals. Founded in 1969, the Council's mission is to disseminate multi-disciplinary information on tall buildings and sustainable urban environments, to maximize the international interaction of professionals involved in creating the built environment, and to make the latest knowledge available to professionals in a useful form.

The CTBUH disseminates its findings, and facilitates business exchange, through: the publication of books, monographs, proceedings and reports; the organization of world congresses, international, regional and specialty conferences and workshops; the maintaining of an extensive website and tall building databases of built, under construction and proposed buildings; the distribution of a monthly international tall building e-newsletter; the maintaining of an international resource center; the bestowing of annual awards for design and construction excellence and individual lifetime achievement; the management of special task forces/working groups; the hosting of technical forums; and the publication of the CTBUH Journal, a professional journal containing refereed papers written by researchers, scholars and practicing professionals.

The Council is the arbiter of the criteria upon which tall building height is measured, and thus the title of "The World's Tallest Building" determined. CTBUH is the world's leading body dedicated to the field of tall buildings and urban habitat and the recognized international source for information in these fields.

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ILLINOIS INSTITUTE OF TECHNOLOGY

ISSN: 1946 - 1186