INTRODUCTION
This portfolio is a cross section of my design education which spanned 5 years, 6 internships, 8 studios, workshops both international and domestic, competitions, and individual projects. I highlight 2 of my more substantial projects in addition to 6 smaller case studies.
What if a city adopted balloons as a secondary mode of transit? Can they do more than move people?

Balloons
Bunker Hill Monument
Cambridge Marriott
John Hancock Tower
Boston City Hall
Boston Commons (Staging Area)
Harbour Islands

Fig 4. Scenic Balloon Route

Fig 1. Prep in Commons

Fig 2. Boston, USA

Fig 3. Venice, Italy

Fig 5. Mem. Drive

BALLOON BOSTON

What if one could appreciate Boston through an iconic network of specialty aerial transports? Boston residents can finally emerge from their dank underground corridors and take to the skies. Balloon Boston is a new civic attraction, rivaling the gondoliers of Venice in its ability to provide passengers with a truly revealing city experience. Not only are passengers delighted by the cityscape, balloons themselves are a wonderful addition to the skyline, a site to see by the public for miles around.

The city is gifted with Boston Commons (Fig. 1), providing a green space large enough for the daily inflation of large hot air balloons. From the Commons, balloons begin their circuit of the city (Fig. 4), ending at any number of destinations. For the tourist, this is the perfect way to traverse the city, even if they’re looking to reach Harvard Yard.

By selling advertising space on the balloons (Fig. 5), Boston may expect to make a tidy profit, while keeping fare relatively low. Businesses have more advertising space, passengers have a new way to experience Boston, and the public enjoys an intriguing addition to a once monotonous skyline.
How can China develop **high density**, **low carbon**, yet **livable** cities?

**DEVELOPING JINAN’S NEW LOW CARBON CITY**

The rapid pace of China’s urbanization, although outstanding, has created a landscape of centrally planned cookie-cutter super developments.

Many of the elements of sustainability, as we know them, have been neglected in these new cities. Instead of walkable streets, ever wider roads encourage car-commuting culture and destroy urban outdoor environments. Instead of durable, passive architecture, building are built cheaply and with a maximum life of only one or two decades.

This studio exercise seeks to generate new urban forms that address issues of livability and low-carbon lifestyles, as well as provide the high densities that China demands from its developments. The use of an energy pro forma was important for gauging whether our designs made meaningful cuts to carbon output.
LOW CARBON | Key Strategies

**Mobility** — Pedestrian and transit-oriented
Reduce car use

**Diversity** — Mix of uses
Variety of densities

**Outdoor Living Room** — Creating Community
Small Unit Size
Geothermal

**Ecology** — Multiscale approach
Using sun, wind and water

Urban Footprint

- **Traditional Hutong**
  - FAR: 0.5
  - coverage: 50%

- **Mid-Rise Slabs**
  - FAR: 1.0
  - coverage: 25%

- **High-Rise Towers**
  - FAR: 2.0
  - coverage: 10%

**New Low Carbon Cluster**

The footprint of the New Low Carbon Cluster is unique in that it does not follow the typical inverse relationship between FAR and land coverage. Instead, if both FAR and land coverage are kept high, a new urban form is derived to address issues regarding low-carbon lifestyles and increased livability (next page).
OPTIMAL SQUARE FOOTAGE
Compact efficient units save space and increase energy performance.

SUNLIGHT OPTIMIZATION
Building facing south for solar gain.

NATURAL VENTILATION
Building depth allows for cross ventilation.

PRO FORMA PERFORMANCE (MJ per HH per year)
1. Small unit size (75 m²) = 10,603 MJ
2. Natural ventilation = 2612 MJ
3. Percentage of wall facing south = 1404 MJ

VENTILATION STACK
Towers create pressure differentials to ventilate.

SOUTHERN EXPOSURE
Buildings expose to sun gain heat during cold seasons.

WATER MANAGEMENT
Grey waters enter a double cycle of filtration and solar heating.

TROMBE WALLS
Trombe walls improve overall building thermal performance.

THERMAL MASS
Heavy thermal mass holds consistent temperatures.

CIVIC ENERGY CENTER
Serves as an energy dashboard to inform residents on their energy performance.

GREEN ROOF
Reduces urban heat island and provides insulation.

MIXED USE
Ground floor commercial provides access to goods and services.

PEDESTRIAN PREFERENCE
Preference is given to pedestrians increasing livelihood and decreasing emissions.

SOLAR HEATERS
Solar heating provides warm water and zero-emissions heating during cold seasons.

OPEN SPACE
Open space equals built space footprint.

BIOSWELLS
Filter grey water and alleviate heat island effect.

GEOTHERMAL
Open space allows for geothermal wells for natural heating and cooling.

PRO FORMA PERFORMANCE (MJ per HH per year)
1. Civic energy centers = 2% reduction
2. Green roofs = 327 MJ
3. Ground level commercial = 357 MJ
4. Limited parking = 660 MJ
5. Rooftop PV and water heating = 15,539 MJ

Low Carbon City | Unit and Cluster
Students are asked to imagine their home in 10 years, as if it were built into the fabric of Boston’s North End. This project attempts to retrofit an underutilized roof-top with a 1000 sqft residence and studio that respects the existing architecture below it. The building includes a courtyard.

What if one were to design their future home among the rooftops of The North End?
How can street design drawings be tailored to a broad range of viewers and agendas, yet still be a credible design tool?

A study was performed to determine how drawings for designing streets may be tailored to a broad range of viewers and agendas, yet still be viewed as a credible design tool for architects. With a growing number of cities designing their own guidelines according to the complete streets movement, it’s necessary to develop a graphic style that not only appeals to the typical engineering aspect of streets, but is also robust enough to include details for various design components and spatial qualities not before considered in street design.

New drawings and information graphics were invented to better describe multi-modal streets, spatial qualities, and a fully conceived taxonomy of urban street types. It was discovered that three drawing types are especially useful for conveying this type of information: Perspective-Sections, Overhead Views, and Transects.

**Fig 1.** Overhead view with in-diagram captions

**Fig 2.** Section Perspective with Table of Contents

**Past Trends**
- Shared Streets
- Dirt and Clay Pavement
- Slow and Simple Travel Modes
- Nature as Commodity
- Opaque Building Facades as Wall to Sidewalk Realm

**Future Trends**
- Lane Use and Ownership Designated
- Diverse and Durable Paving Types
- Fast and Diverse Travel Modes
- Nature as Drainage Infrastructure
- Increasing Facade Permeability to Sidewalk Realm

1960
- 1961 Subdividing for Traffic Safety (ITE)
- 1961 Parking Dimensions (Automobile Manufacturers Association)
- 1965 Traffic Engineers Handbook (ITE)
- 1967 National Committee on Uniform Traffic Laws and Ordinance

2010
- 2010 Deployment of Dedicated Cycle Lane Network (Boston)

2060

A New Urbanist’s Right of Way Travel Lane

Street Name Inspirations Examples
- 1850 Trees Chestnut Street, Elm Street, Walnut Street
- 1940 Picturesque Drive Storrow Drive (Michigan)
- 1800 Landmarks, Heroes Church Street, Washington Street
- 1880 Avenues Commonwealth Avenue

1872 First Brick Rural

1850 First Asphalt (NYC)

1870 Coal Tar

1880 Trees

1905 Lightning Rod

1908 Ford Model T

1910 Dedicated Cycle Lanes

1910 City Planning of Streets and Lots

1935 Parking Meter

1940 Signs Invented

1950 Highway Administration

1960 Boulevards, Park, Court

1970 Creative Streets Guidelines

1980 Streets and Lots

1990 Crosswalks

2000 Bicycle Facility Types

2005 Complete Streets

2010 Transit Lanes & Widths

2015 Smart Street Trees

2020 Full Development

2060 Natural Trees

**Fig 2.** Transect Drawing: 100 yrs of a Boston Street

- At right, let’s give the streets back to everyone.

- All paving uniform height

- Street Name Inspirations Examples

- Street Activation

- Bike Lanes

- Street Trees

- Sidewalk Realm

- Transit Lanes & Widths

- Principles

- Vision

- Multimodal

- Green

- Smart

- Safe, vehicular travel lane

- Light Commercial

- No immediate parking, but the way is marked

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Can a group of students collaborate to make an interconnected collage of unique sculptures?

A ‘CITY’ OF SCULPTURES

A class of ten students was assigned the task of creating a landscape of interconnected, concrete components (Fig 1). Not only an exercise in aesthetics, each classmate had to insure that their components would interlock with their neighbors’ in a manner that added to the whole of the composition. Working democratically, the students planned the layout of this ‘city,’ as well as a design framework. Not only an exercise in aesthetics, students needed to constantly collaborate with each other, ensuring that all of the pieces aligned properly. This was an assignment with many layers, testing our ability to work together as uniquely motivated yet interdependent designers.

Fig 1. Placement of my sculpture (red) among those of classmates.

Fig 2. Excavation of concrete sculpture from formwork of plywood and extruded foam. Note that red dye was added to concrete mixture.

Fig 3. Intersection of sculpture (red, right) with adjacent classmate’s creation (grey, left).
BEACON HILL & SOUTH END INSERTION STUDY

Planners must be careful, as the urban fabric of a city might easily be taken for granted as some immutable grid of ordained patterns.

This quick exercise demonstrates how an otherwise alien fabric such as Beacon Hill—located only a short distance away—can be used as a tool to quickly reimagine the fragmented fabric of the South End in Boston, Massachusetts.

The original figureground (Fig 1), reveals how modern development along Washington Street in the South End has broken the traditional town house grid in favor of larger, object-like buildings such as a low-income housing project, a mid-rise condo, an electronics manufacturer, and an elementary school.

Figures 2, 3, and 5 attempt to re-stitch this once strong main road running south-west to north-east by using only the patterns available in Beacon Hill. Figure 4, on the other hand, juxtaposes the South End against a theoretical city of Beacon Hill scaled fabric.
How can one utilize computation to create custom forms out of a kit of simple components?

MASS CUSTOM HOUSING

A design challenge for future architects is to create unique and customizable spaces out of increasingly standardized components. “Mass customized housing” is a concept especially relevant to China, where its enormous population and wealth distribution creates a market where small-scale custom buildings are less prevalent.

The current image of mass-produced housing is of highly regular and monotonous urban forms. Therefore, the project strives to produce natural, analogue forms and program arrangements out of simple and uniform modules of various scales. These modules are integrated throughout the architecture, providing components from primary structure to facade detail and ornamentation.
Outward protrusion offers sun shading
Privacy and ledge for balcony
Flat envelope surfaces approximated by larger block units for greater efficiency and visual differentiation of facade
Primary floor slabs support secondary ones, allowing for discontinuity of envelope in multistory structure
One-level systems do not require extensive structural hierarchy
Primary floor slabs support secondary ones, allowing for discontinuity of envelope in multistory structure
Ground topology extruded to roof landscape

Tange Unit Plan with Linear Row Aggregation

Unit Plan with Computational Aggregation Pattern

Varying Resolution of Surface Approximation

Tange Unit Plan with Linear Row Aggregation

Unit Plan with Computational Aggregation Pattern

Varying Resolution of Surface Approximation
1st place
Velux Design Competition, 2008

THE BLOSSOM HOUSE

An open flower with fanned petals has more surface area, and can better utilize reflected light to capture the attention of pollinators. Similarly, the guest house is comprised of multiple wings that fan into different cardinal directions, taking advantage of the lighting opportunities specific to each direction.

While each wing, or petal, of the house accommodates certain living spaces, they do not operate autonomously. Rather, they make use of adjacent wings for shading, reflected light, and other effects.

What if MIT had a guest house for visiting scholars that utilized natural daylight in a novel way?

Fig 1. Elevation of south-west facade with interior sketch of dining room (above) and bedroom corridor (right).

Fig 2. Various rooms (or petals) from left to right: dining space, lounge, bedroom wing. Ground floors include meeting room and atrium.

Fig 3. Conceptual sketches culminating in final proposal (top).