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ACOUSTICS OF TRADITIONAL CHINESE THEATRICAL BUILDINGS

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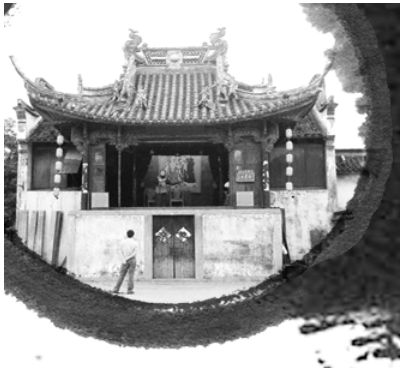

ACOUSTICS OF TRADITIONAL CHINESE THEATRICAL BUILDINGS

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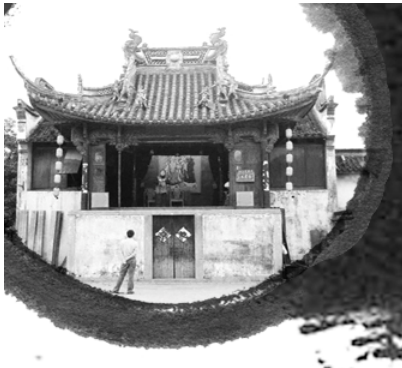
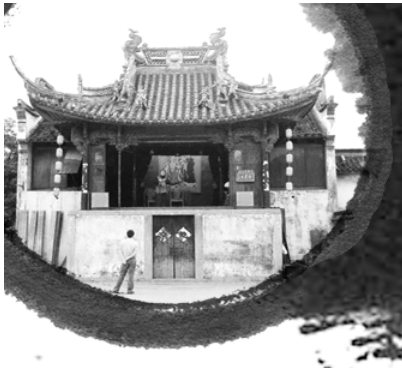


PART 1 : A BRIEF INTRODUCTION OF CHINESE OPERA

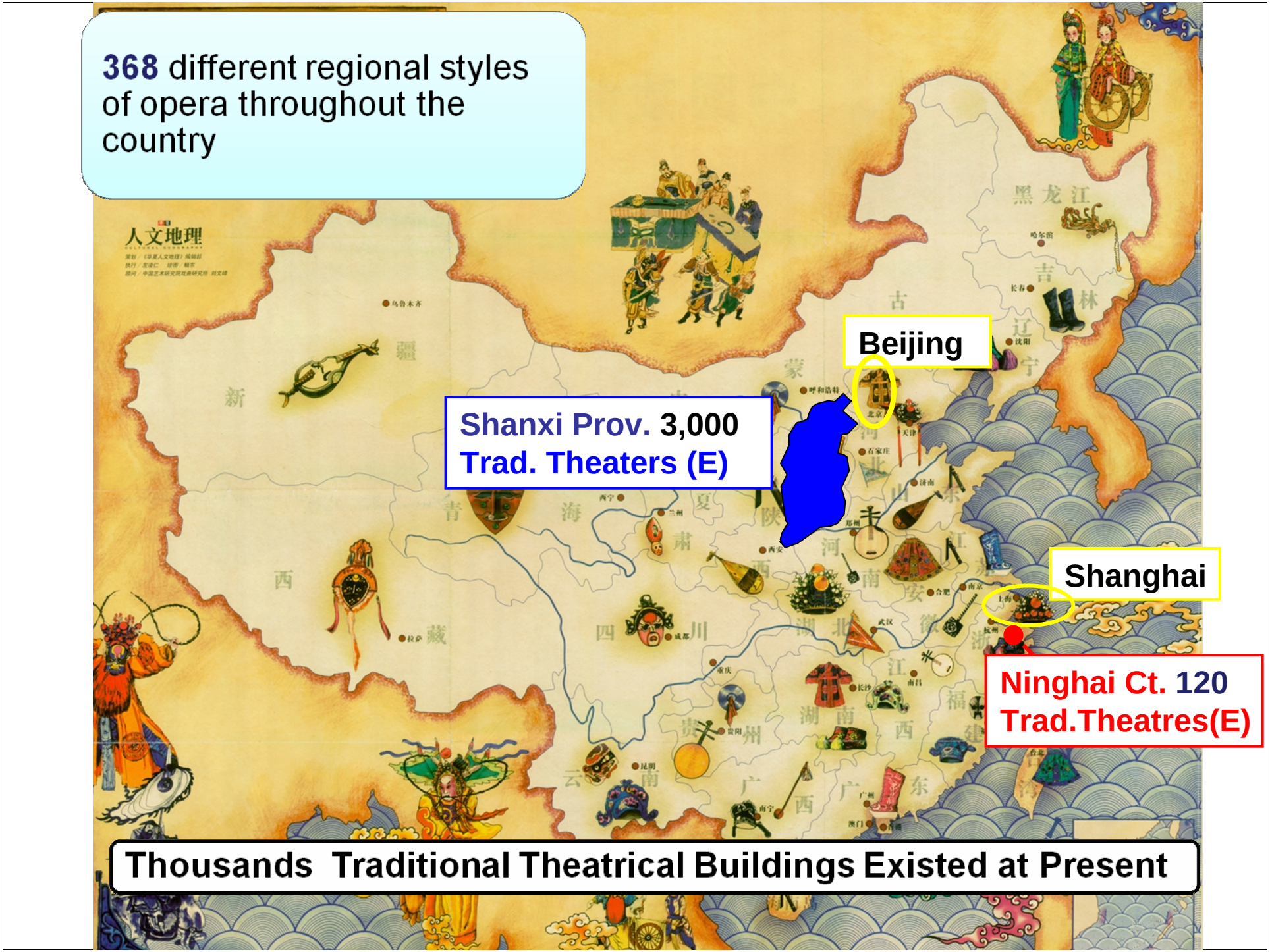
- ***CHINESE OPERA***, Greece Tragic-comedy and Indian Sanskrit Play are the three oldest dramatic art forms. But only Chinese opera is still performing today.
- ***CHINESE OPERA*** has become a traditional art form since Yuan Dynasty (1271 - 1368) and became popular among common people.
- ***CHINESE OPERA*** is a comprehensive performing art which combines singing, music, dialogue, acrobatics, martial arts, and pantomime. It represents the culmination and distillation of two thousand years of Chinese civilization.



A BRIEF INTRODUCTION OF CHINESE OPERA

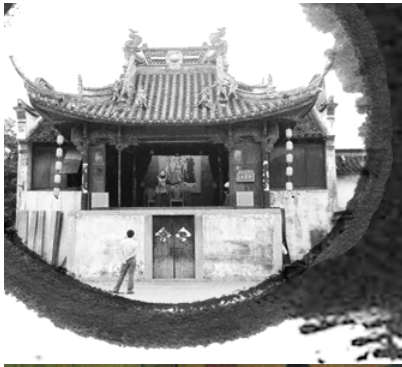
- Over the past 800 years, Chinese opera has evolved into many different regional varieties based on local traits and accents.

- The use of local dialects and unique melodies distinguish the different styles of opera. Today, there are over 300 dazzling regional opera styles.


368 different regional styles of opera throughout the country
人文地理
Beijing
Shanxi Prov. 3,000 Trad. Theaters (E)
Shanghai
Ninghai Ct. 120 Trad.Theatres(E)
Thousands Traditional Theatrical Buildings Existed at Present

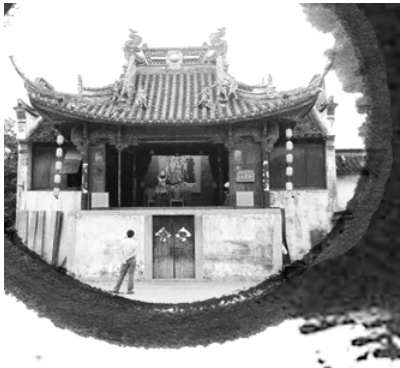
A BRIEF INTRODUCTION OF CHINESE OPERA

A SONG DYNASTY PAINTING (12TH CENTURY)



A BRIEF INTRODUCTION OF CHINESE OPERA

A Tea House Theatre (Late 19th Century)



BRIEF INTRODUCTION OF CHINESE OPERA

- Accompanied by traditional music instruments, actors present unique melodies as well as dialogues which were beautifully written and of high literary value.

- For Chinese, especially older folks, to listen to this kind of opera with various arias is a real pleasure.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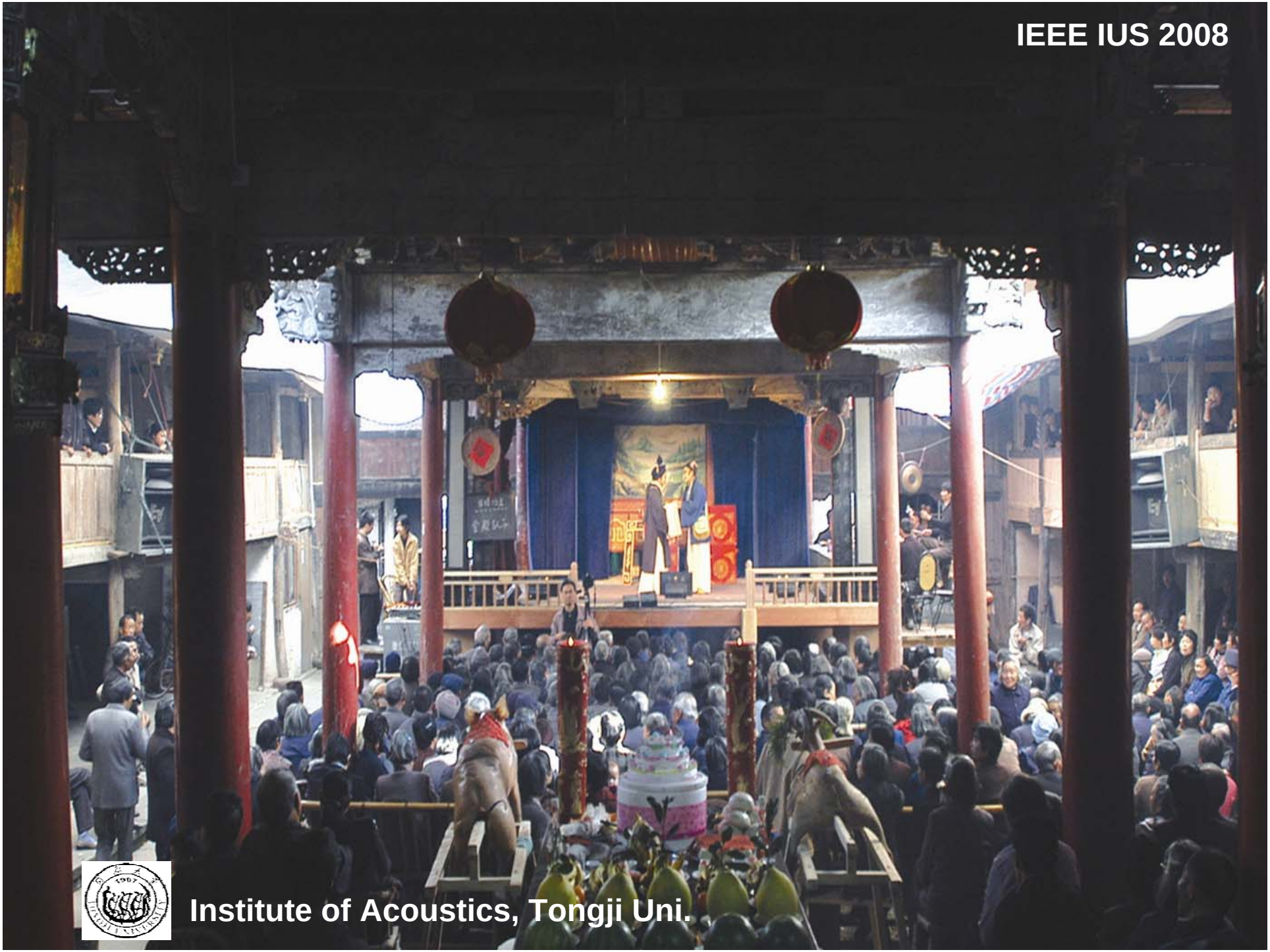
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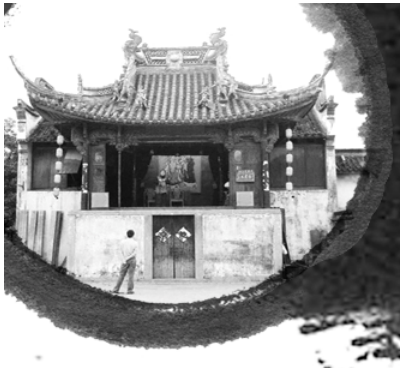
Shakepeare: Midsummer Night's Dream

Played by Teachers and students of American School in Shar

Shanghai Evening Post May 7,2001

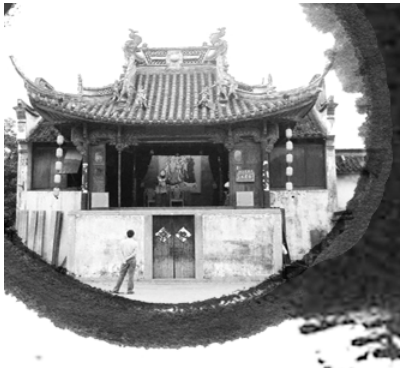


BRIEF INTRODUCTION OF CHINESE OPERA

- In 19th Century Chinese Opera was dominated by a form called Beijing Opera (*Jingju*) featuring colorful costumes, elaborate make up, exaggerated facial expressions, spoken and sung in Mandarin dialect.

Beijing Opera

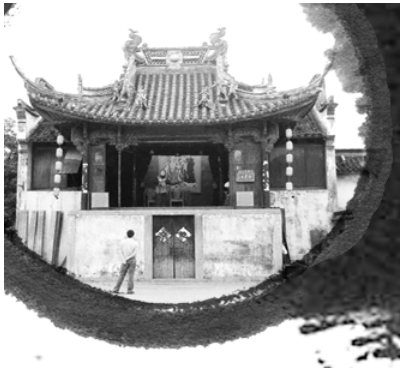
- **Colorful costume**
  Facial expressions
  Elaborate make-up



BRIEF INTRODUCTION OF CHINESE OPERA

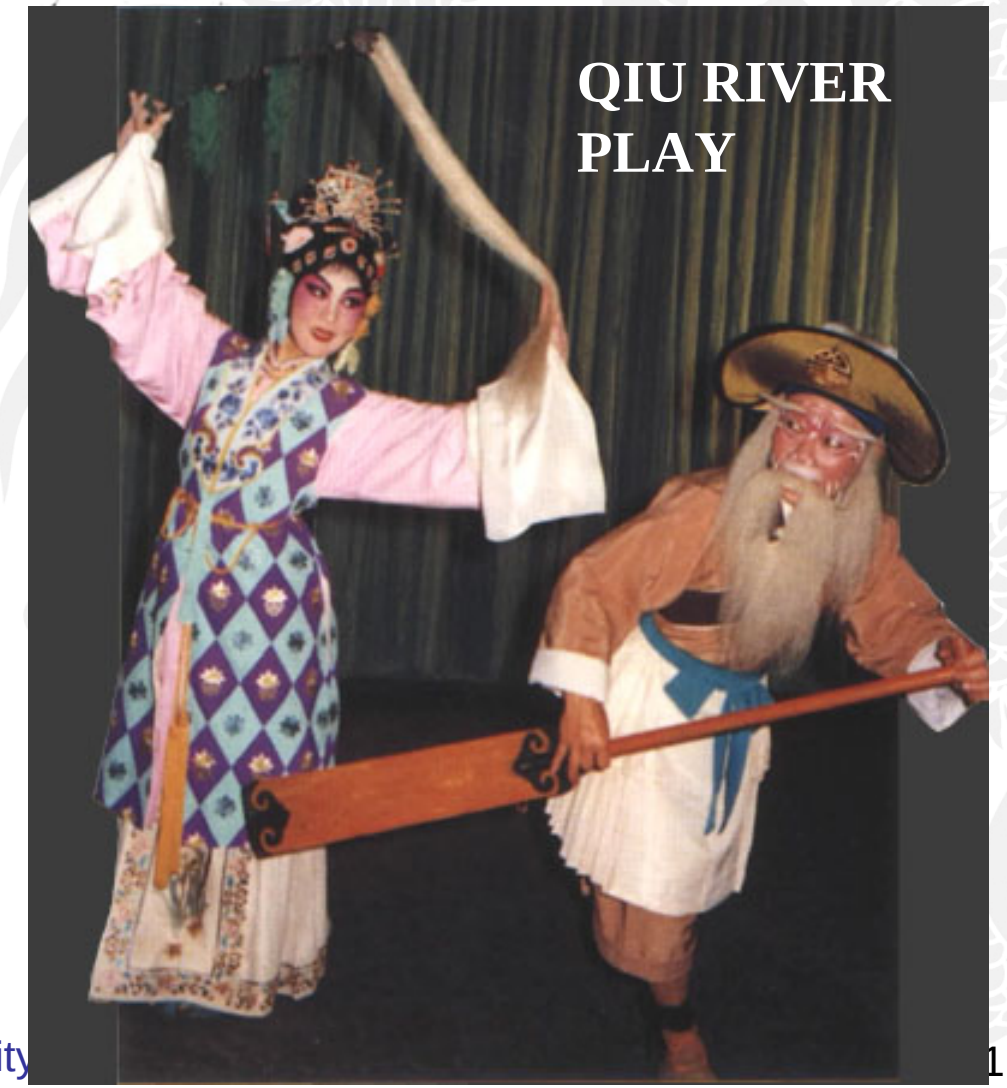
- The acting of Chinese opera is based on allusionary gestures, such as: riding a horse, rowing a boat, or opening a door just expressed by body movements.

- Therefore, a battle between rival troops could be performed on a very small stage, around 50 sq. meters; or historical events spanning hundreds of years could be performed without changing settings.



BRIEF INTRODUCTION OF CHINESE OPERA

The play **QIU RIVER** depicts the scene of taking a boat to the cross river by performing with dance in an exquisite, fictitious and artistic expression.



PICK UP THE JADE BRACELET

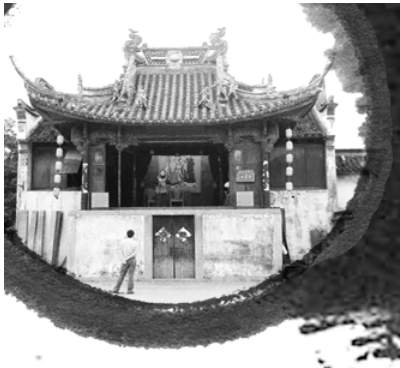
拾 玉 镯

The play shows a young lady's emotion when she faces a love

BRIEF INTRODUCTION OF CHINESE OPERA

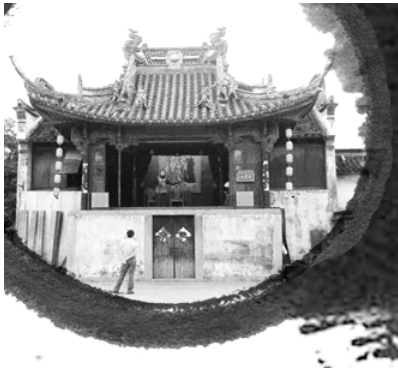
- Performing according to the principle of imaginary actions.
- No realistic stage settings required.

- One table & two chairs are sufficient for most performances.



PART 2

ARCHITECTURAL & ACOUSTICAL FEATURES

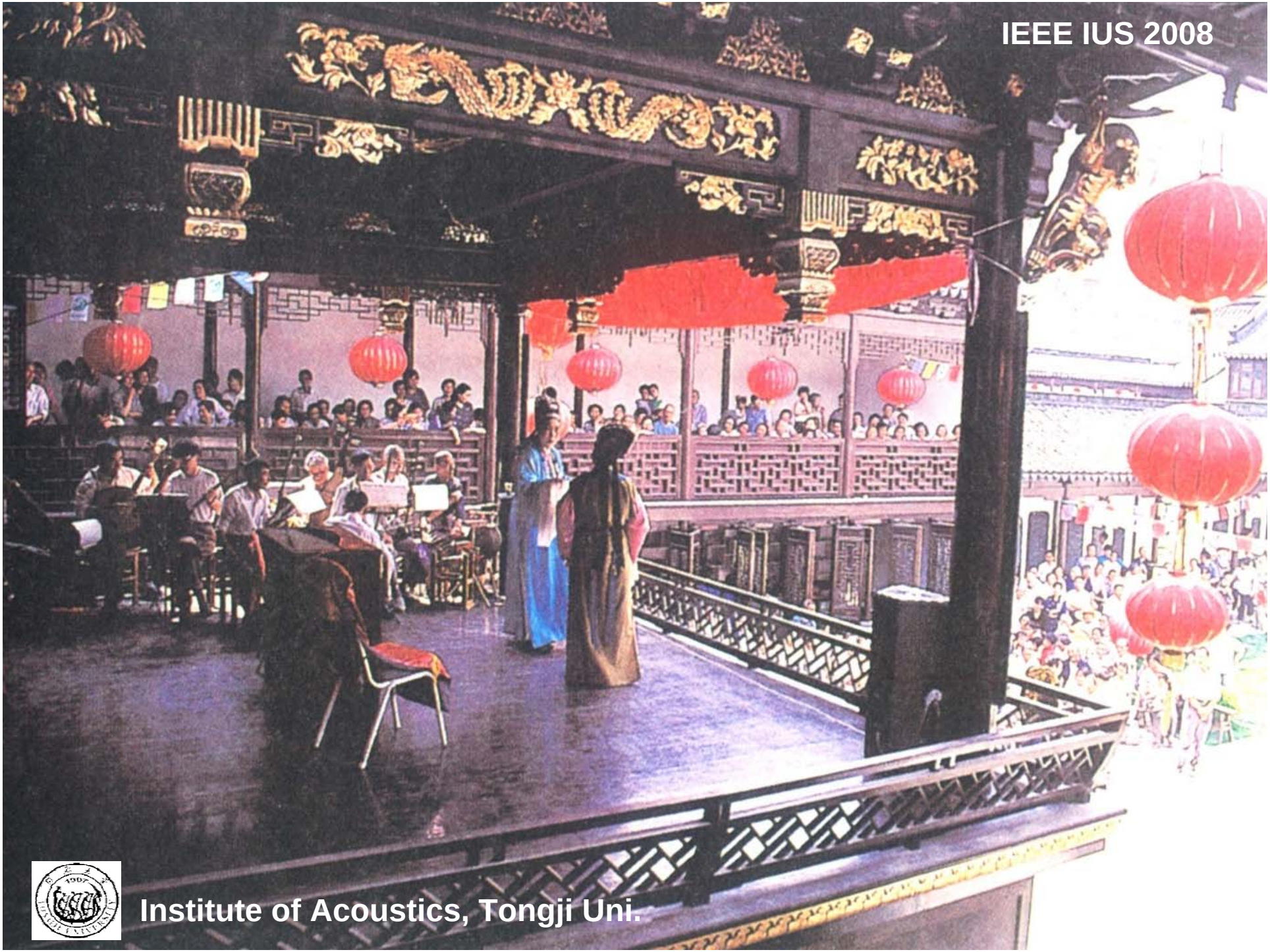


PART 2 : ARCHITECTURAL & ACOUSTICAL FEATURES

- ***THREATRICAL BUILDINGS*** **in China could be traced back to a long history and had well developed during the Song and Yuan Dynasties, 11th – 14th Centuries.**

- ***PAVILION STAGE*** **opened on three sides, thrusting into the audience area is the most prevailing form in traditional Chinese theatres**

PAVILION STAGE opened on three sides , thrusting into the audience area is the sterotype and the most prevailing form in traditional Chinese theatres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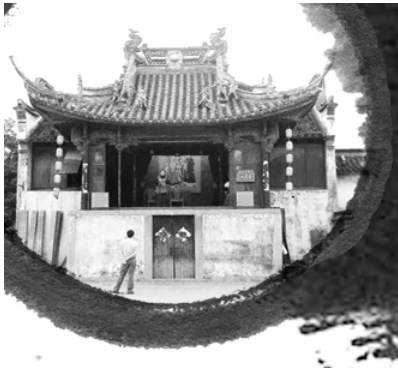
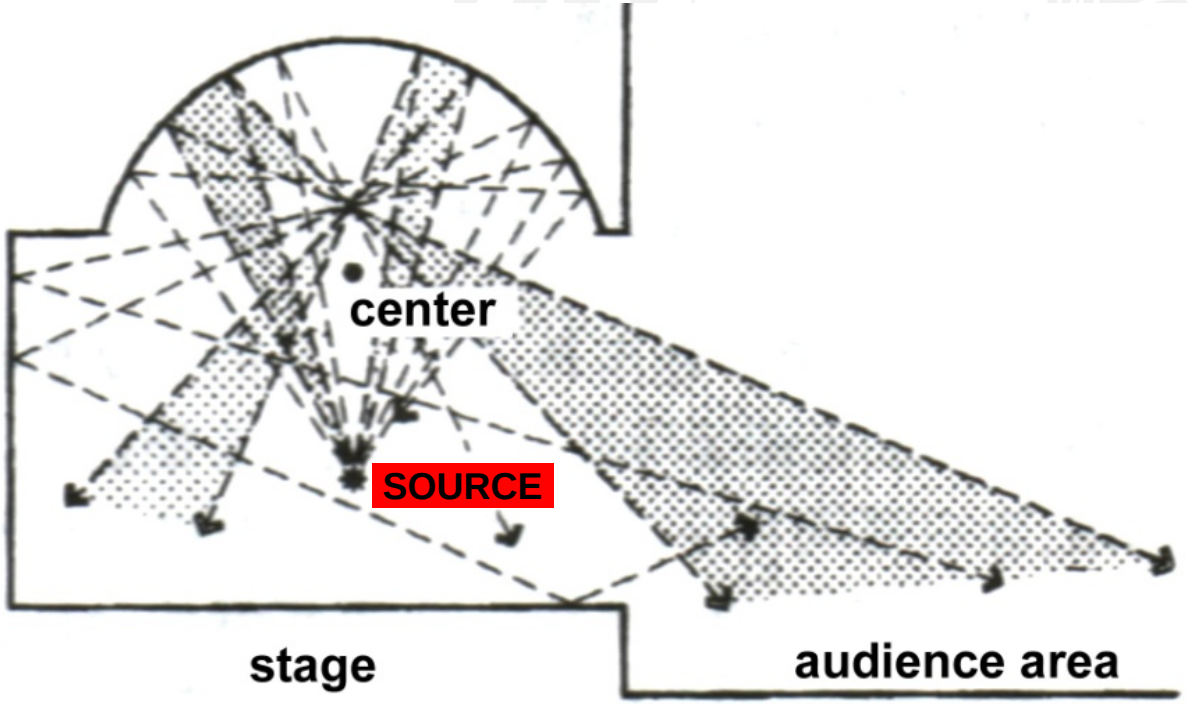
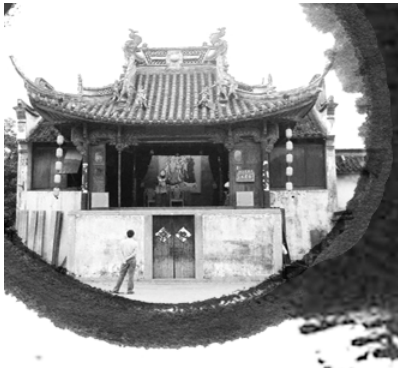


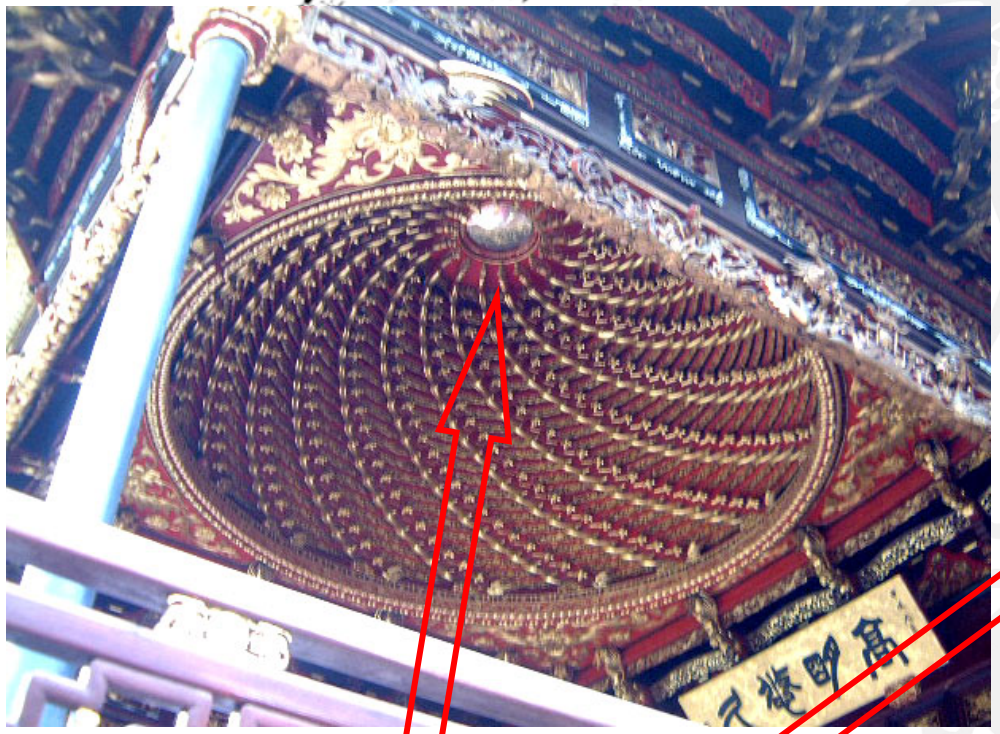
ARCHITECTURAL & ACOUSTICAL FEATURES

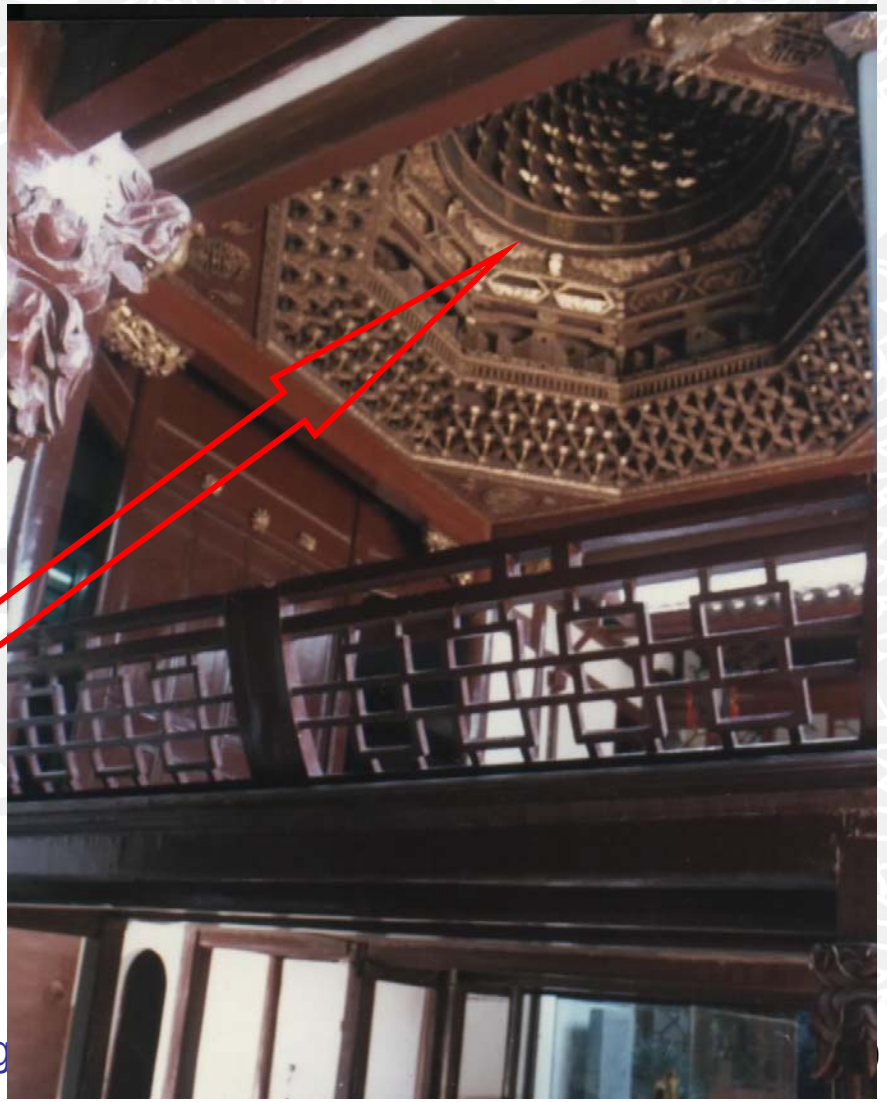
PAVILION STAGE **FUNCTIONED AS A** ***REFLECTING SHELL*** **ENCHANCES THE SOUND DIRECTING TO THE AUDIENCE, AND PROVIDES** ***SELF-SUPPORT*** **TO THE SINGER.**



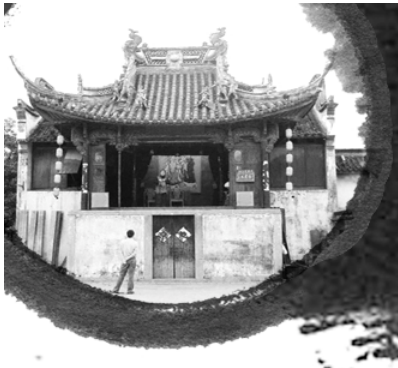
ARCHITECTURAL & ACOUSTICAL FEATURES





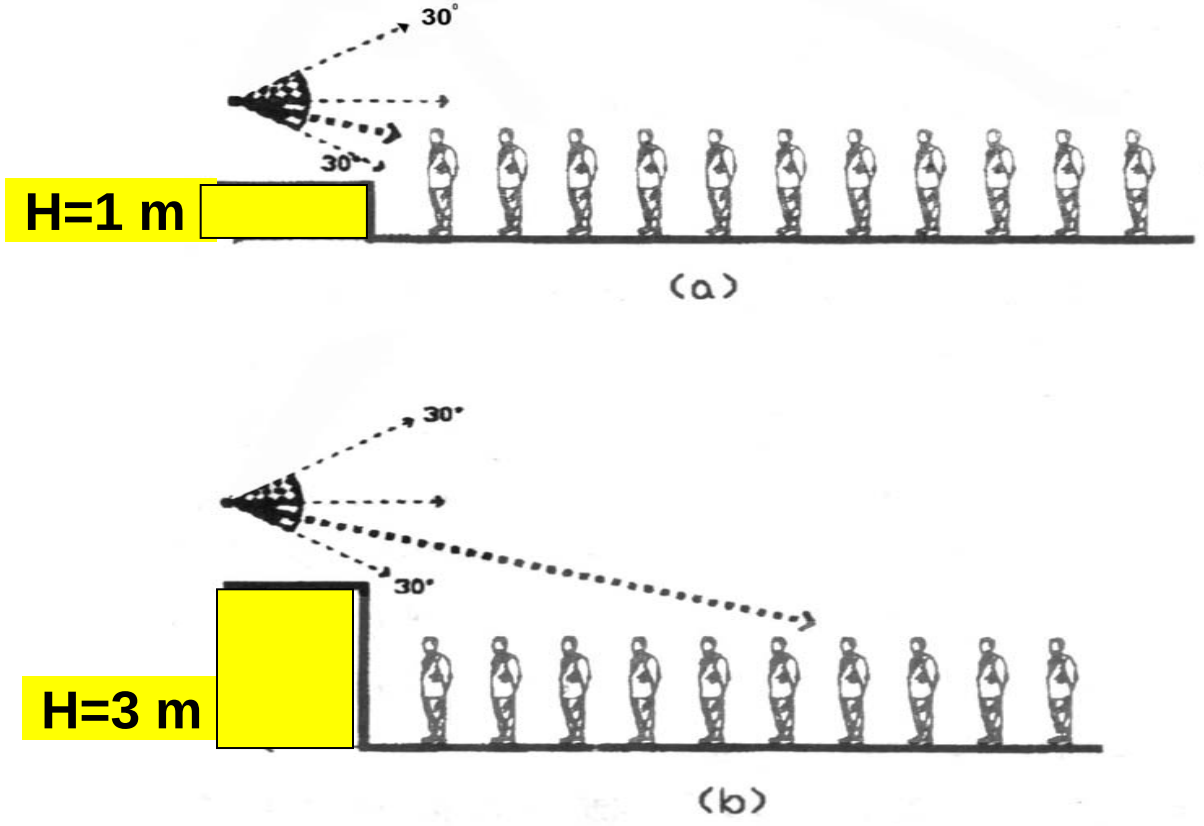


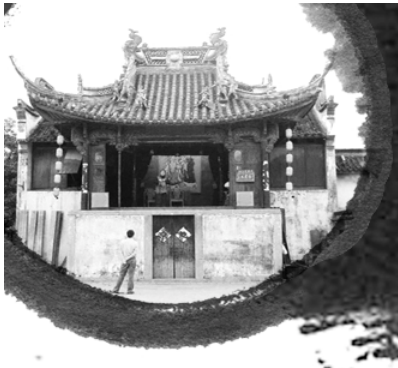
DOME CEILING



ARCHITECTURAL & ACOUSTICAL FEATURES

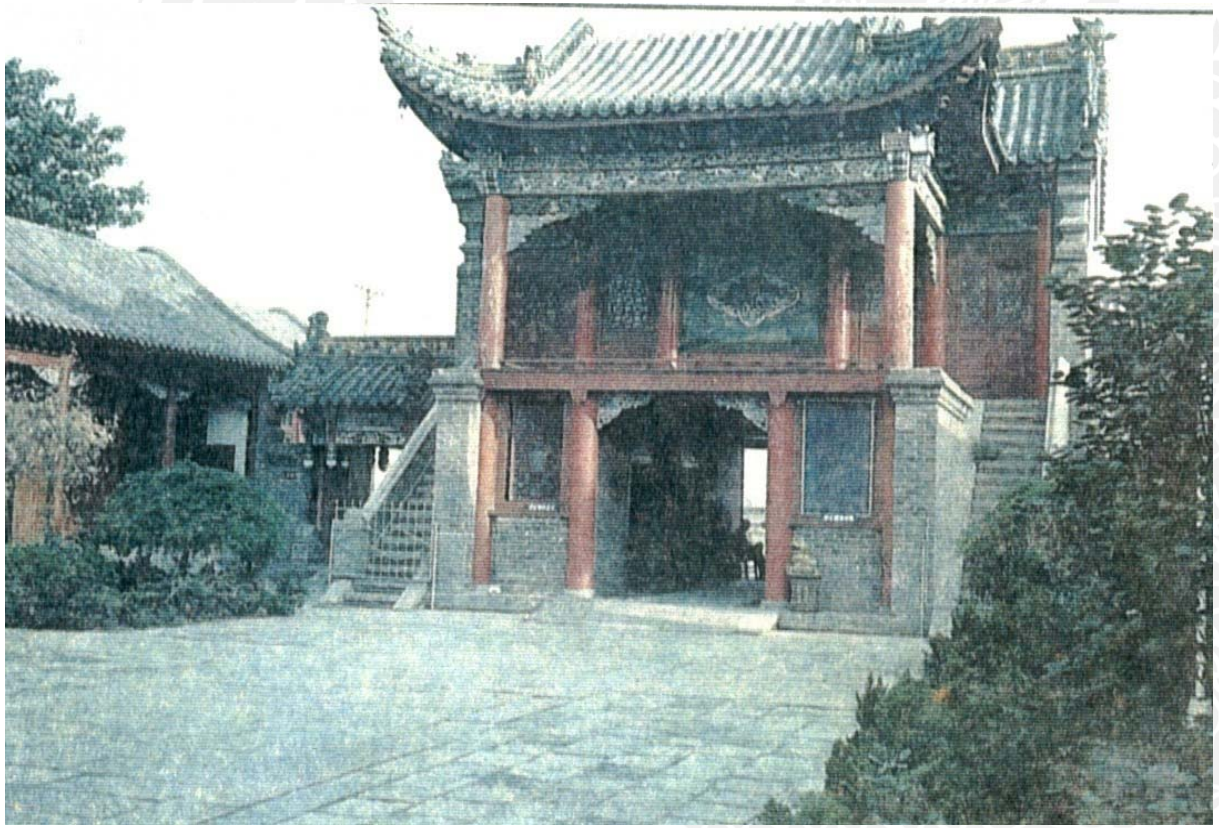
Raised stage benefits both hearing and viewing



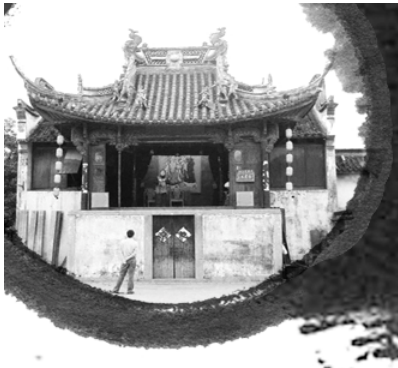


ARCHITECTURAL & ACOUSTICAL FEATURES

- Under the raised stage, courtyard theatres are often placed main entrance to courtyard



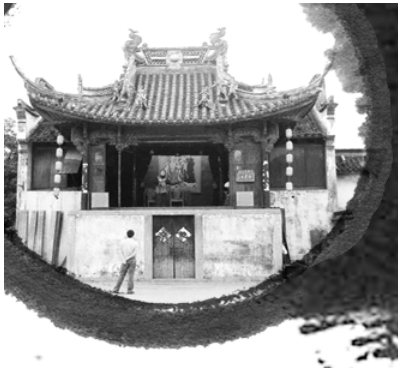
Shan Shaan Gan Guild
Courtyard Theatre,
Kaifeng, henan



ARCHITECTURAL & ACOUSTICAL FEATURES

- **High acoustics satisfaction is the major enjoyment of the audience.**

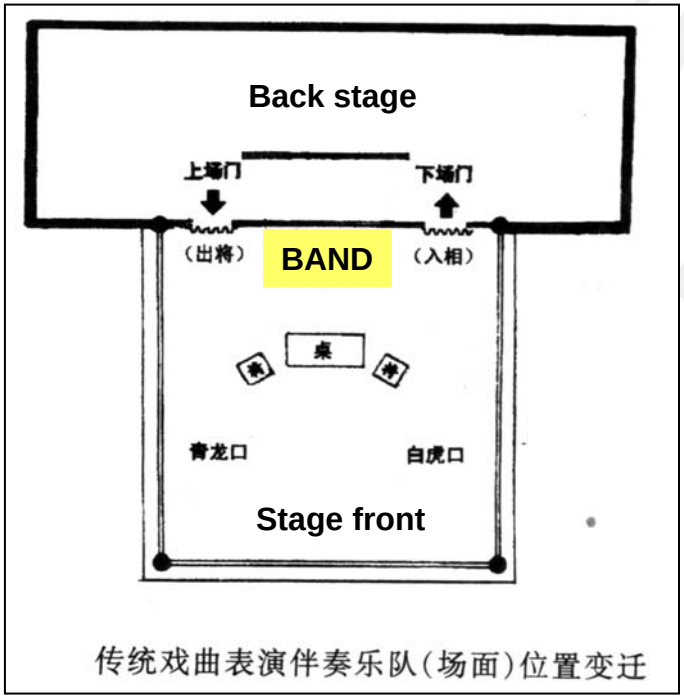
- **The expression for *'OPERA GOING'* in Beijing remains as *TO LISTEN OPERA* up to the present**

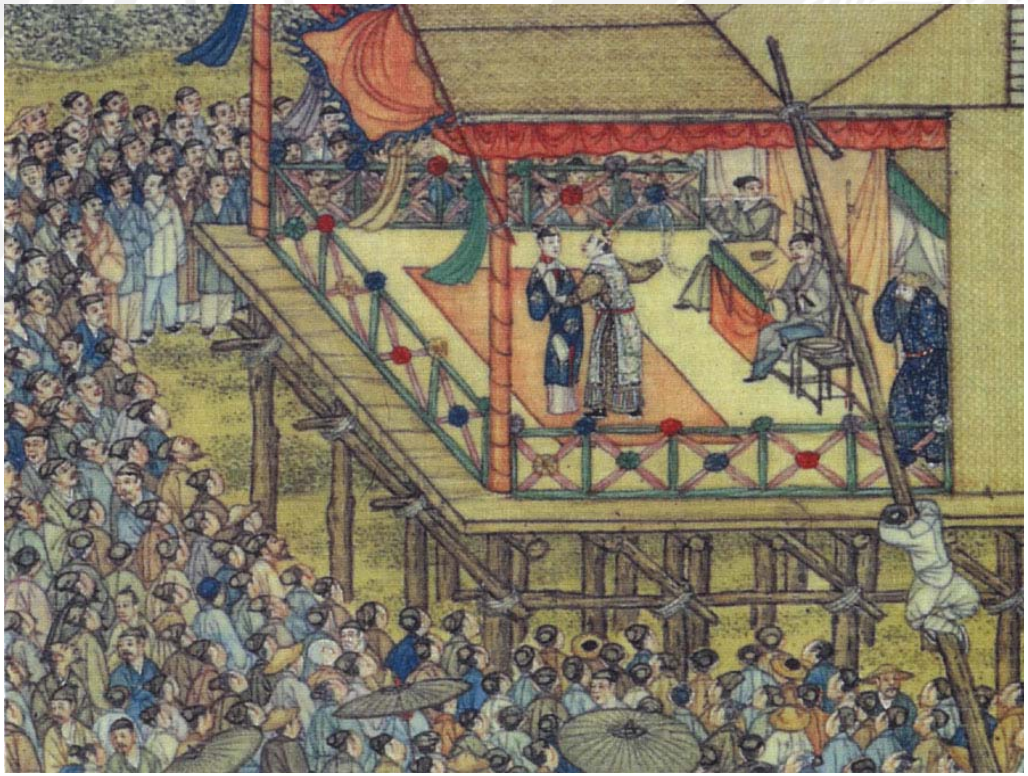


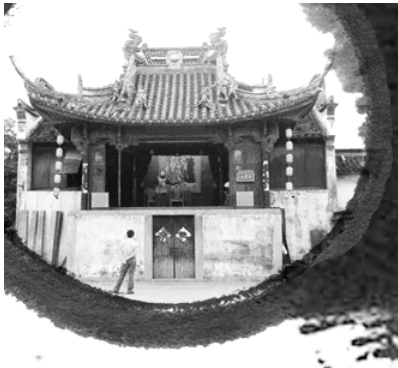
ARCHITECTURAL & ACOUSTICAL FEATURES

- A comparatively rational disposition of the performers resulting in a better acoustic effect.

MUSICAL ACCOMPANISTS playing behind *ACTORS* was a common arrangement in the ancient time.

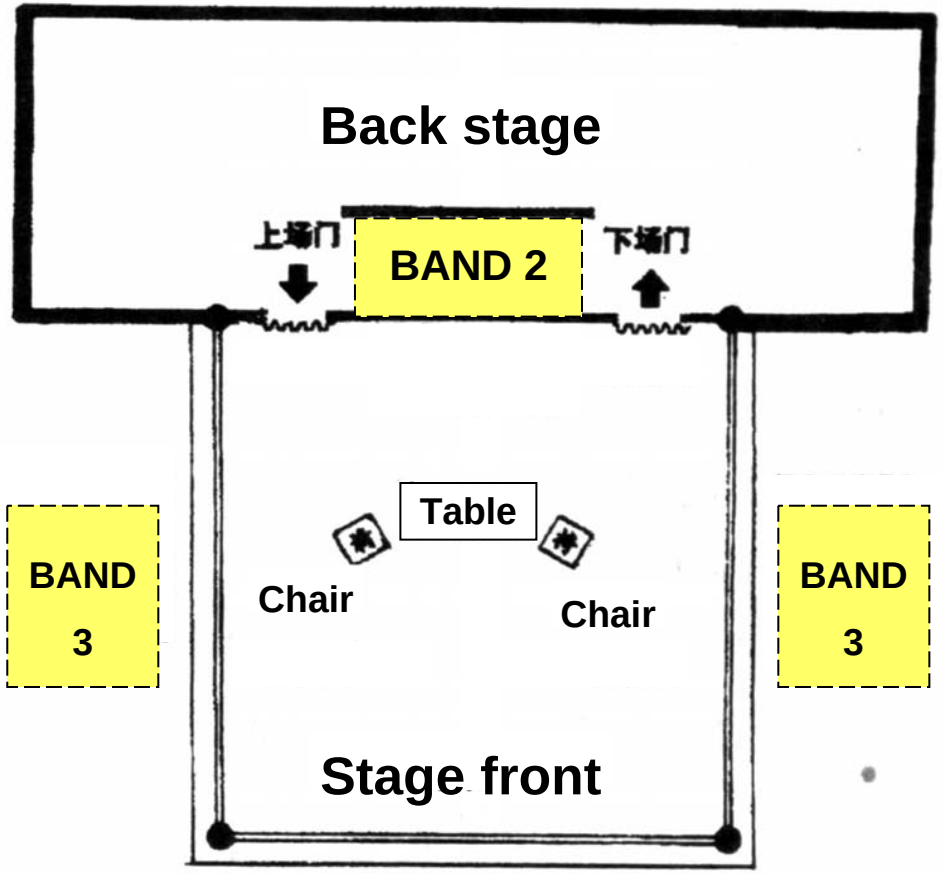






ARCHITECTURAL & ACOUSTICAL FEATURES

Different band position arrangements

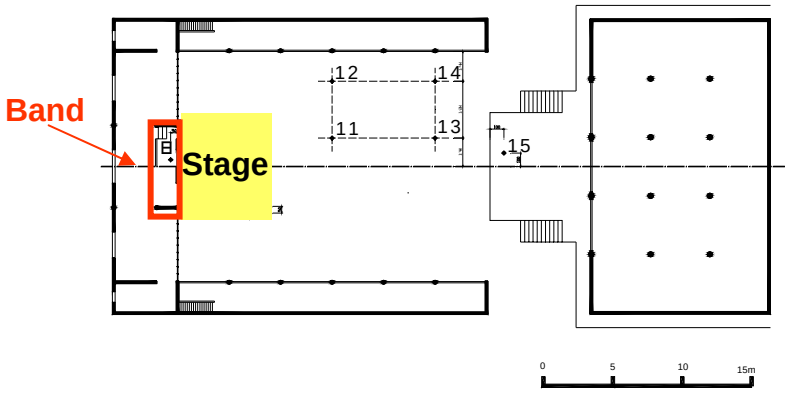


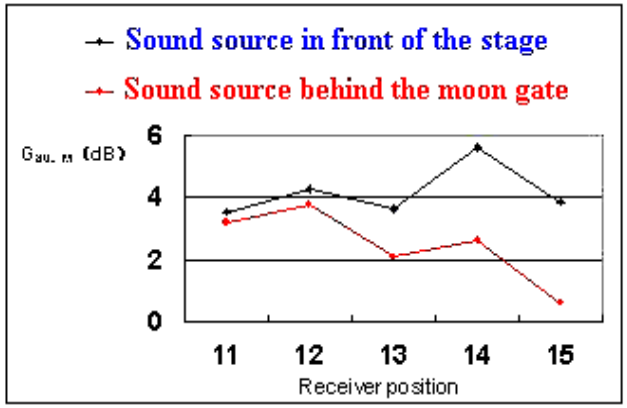
传统戏曲表演伴奏乐队(场面)位置变迁


TRADOTIONAL OPERA USUALLY ACCOMPANIED
BY A SMALL BAND OF 5-7 MUSICIANS

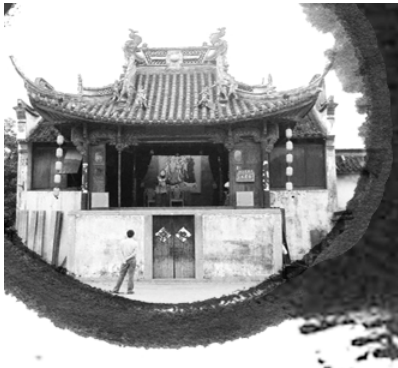
MUSICIANS BEHIND THE MOON GATE.

Quanjin Guildhall, Suzhou 苏州全晋会馆

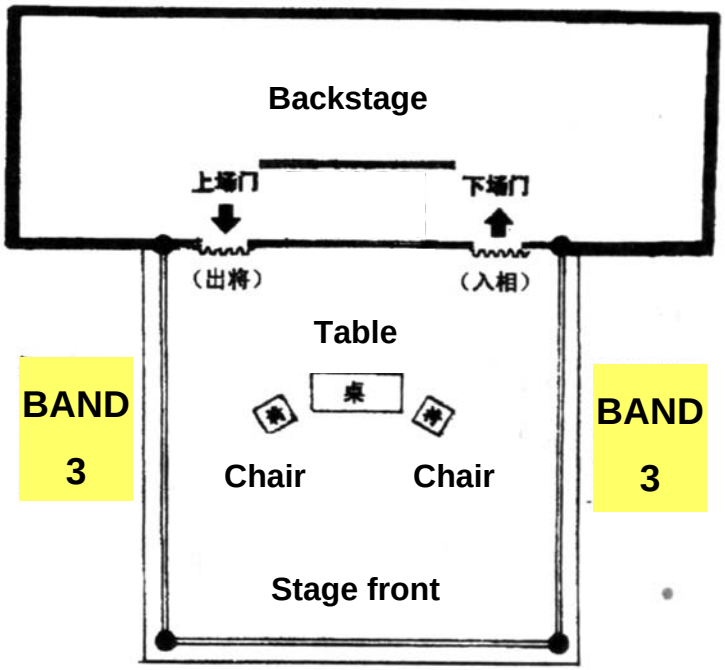




MUSICIANS AT BOTH STAGE SIDES

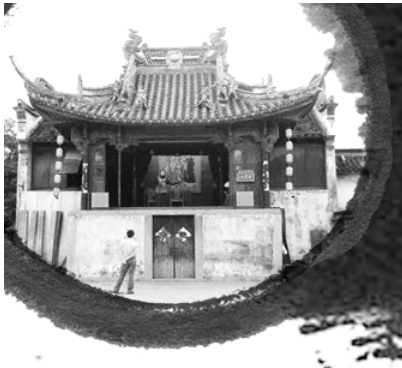


山西 阳城县 郭峪村 汤帝庙戏台



传统戏曲表演伴奏乐队(场面)位置变迁

Left side usually only for acrobatic plays



TYPES OF TRADITIONAL THEATRICAL BUILDINGS

1. OPEN-AIR AMPHITHEATRE

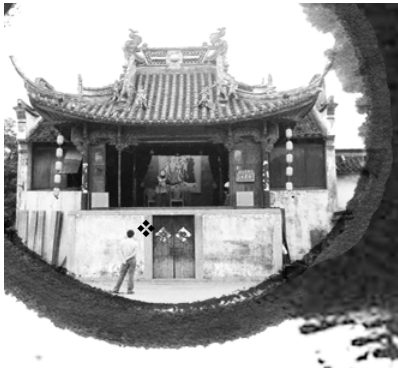
The original type in the ancient time.

2. COURTYARD THEATRE

Courtyard flanked by single- or two story galleries prevailed in China since Ming Dynasty (15th century).

3. AUDITORIUM THEATRE

Built since 18th century as the roof structure of large span became practicable, and suited to the need of regular dairy performances.



OPEN AIR AMPHITHEATRE

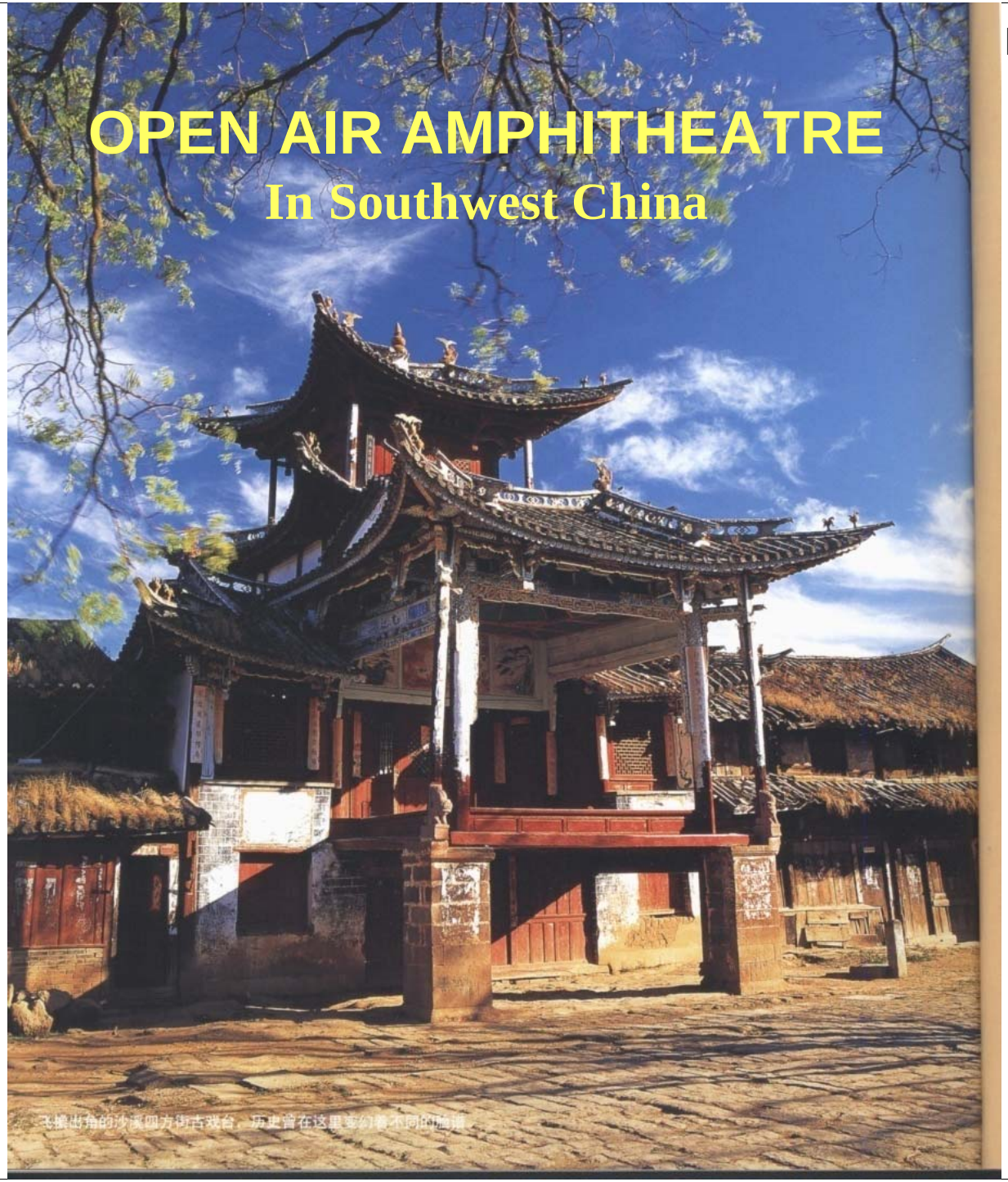
EARLIEST AMPHITHEATRES EXISTED IN SHANXI

A.D.1283 BUILT

山西魏村牛王庙戏台 **(1283)**

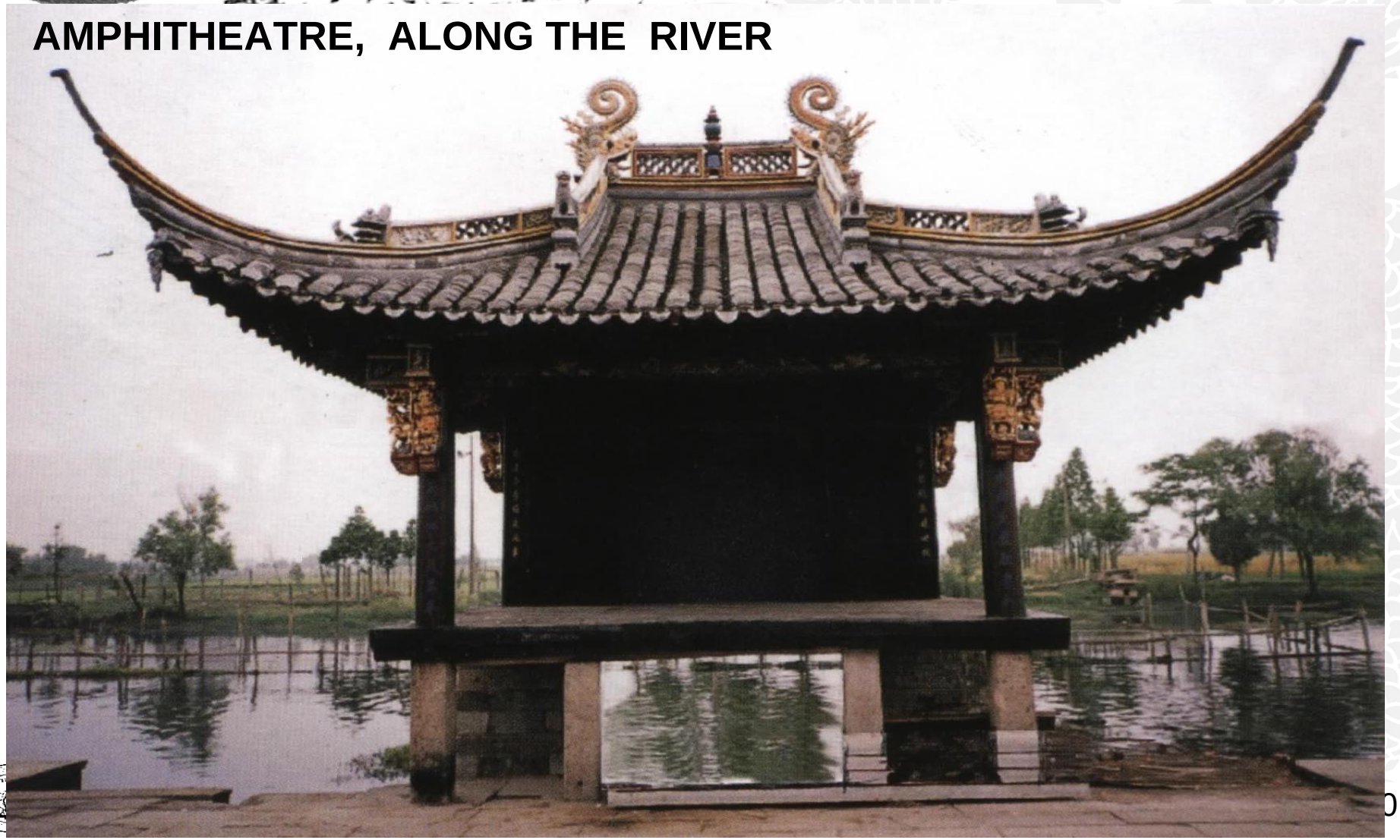
A.D.1324 BUILT

山西翼城乔泽庙（1324）


OPEN AIR AMPHITHEATRE
In Southwest China

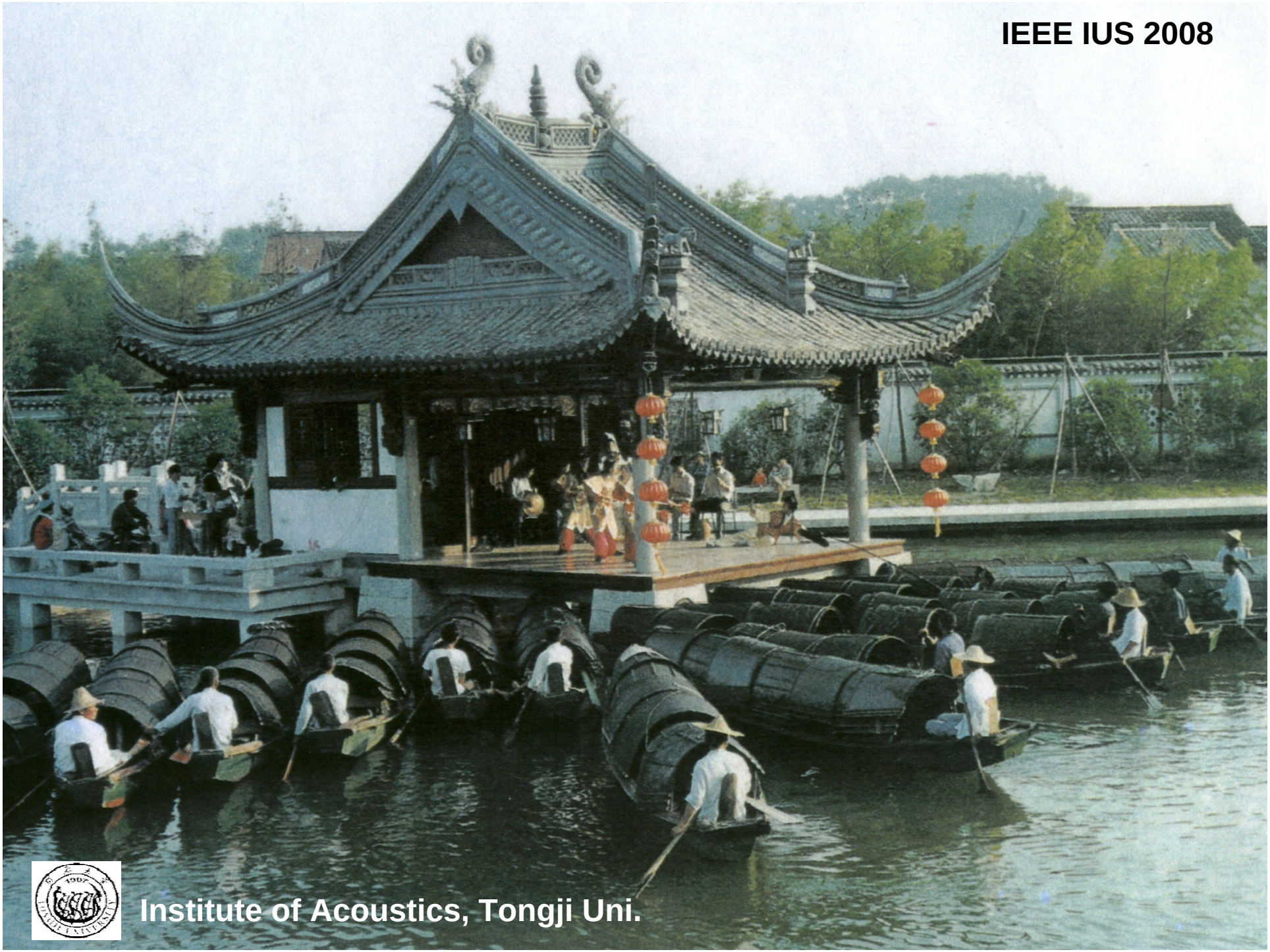
ARCHITECTURAL & ACOUSTICAL FEATURES

AMPHITHEATRE, ALONG THE RIVER



ARCHITECTURAL & ACOUSTICAL FEATURES

AMPHITHEATRE, FACING THE LAKE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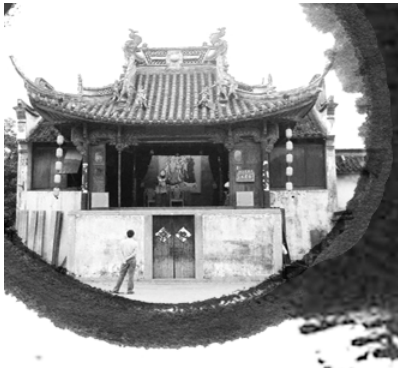
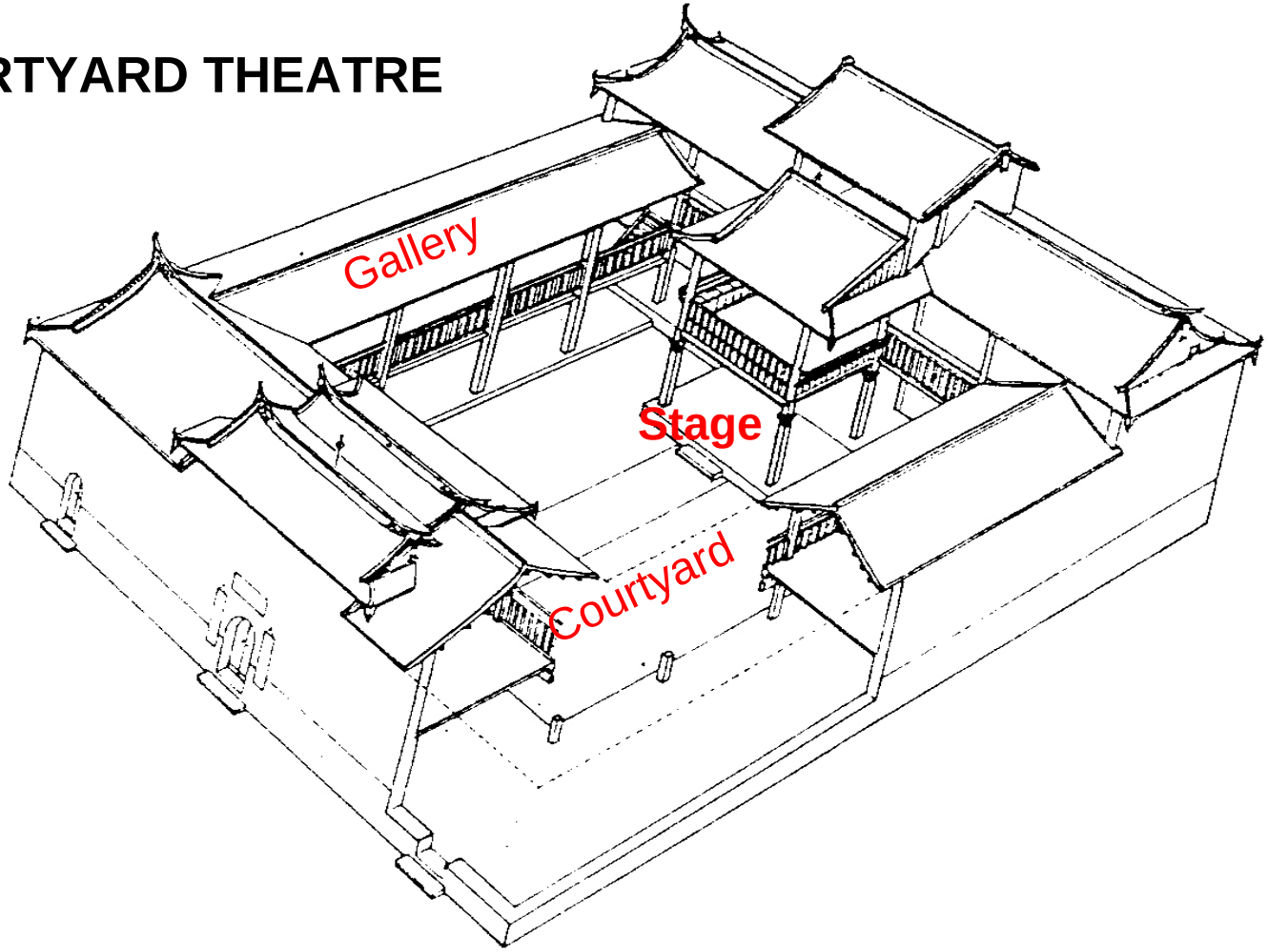
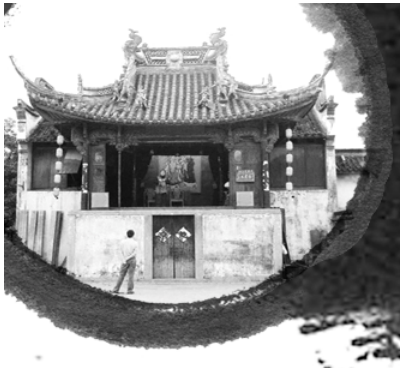


COURTYARD THEATRE

A TYPICAL COURTYARD THEATRE

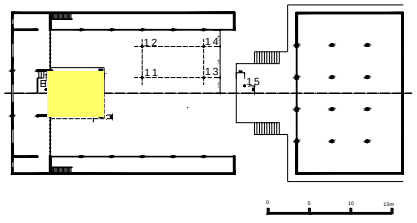




COURTYARD THEATRE

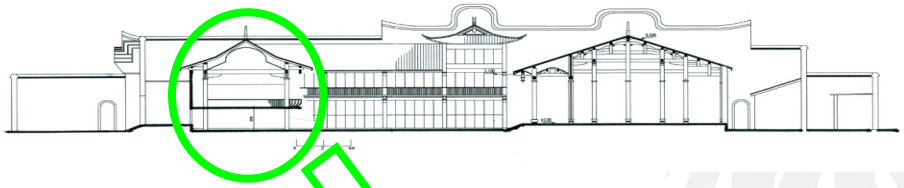
Quanjin Guildhall, Suzhou

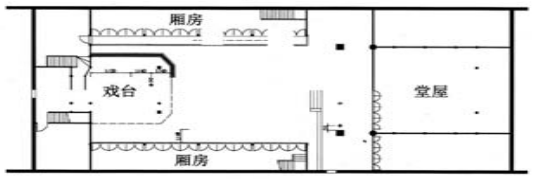
苏州全晋会馆

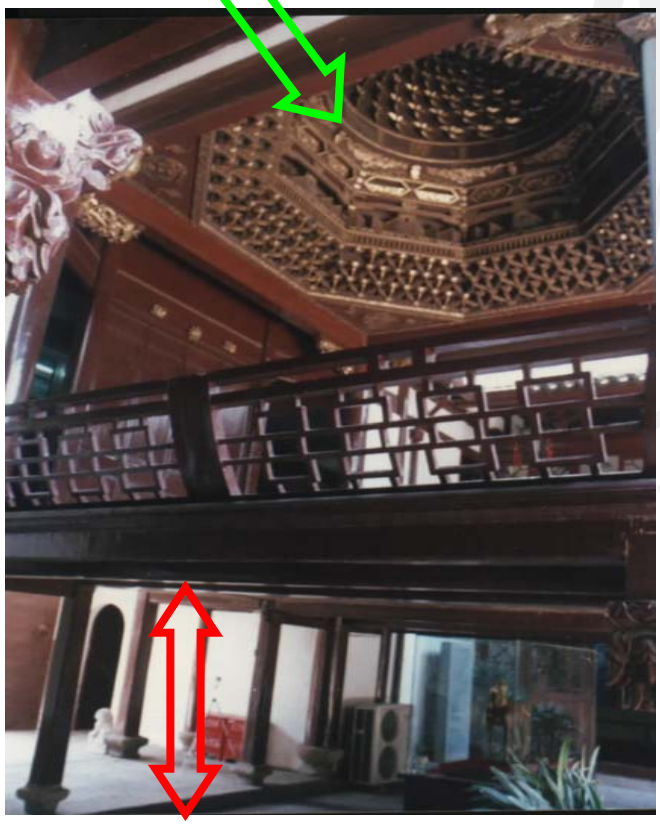


COURTYARD THEATRE

Sanshan Guildhall. Shanghai





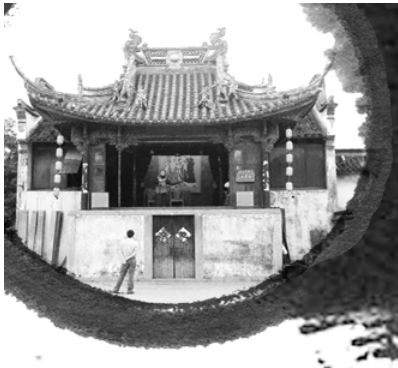


SanShan Guild Theatre, SheQi, HeNan

河南社旗县 山陕会馆戏楼

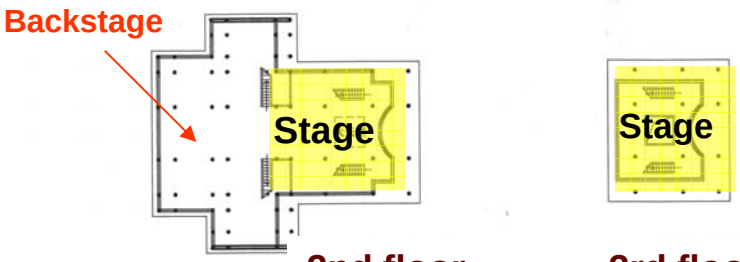
YuCi, Shanxi Province
山西榆次市 城隍庙戏楼

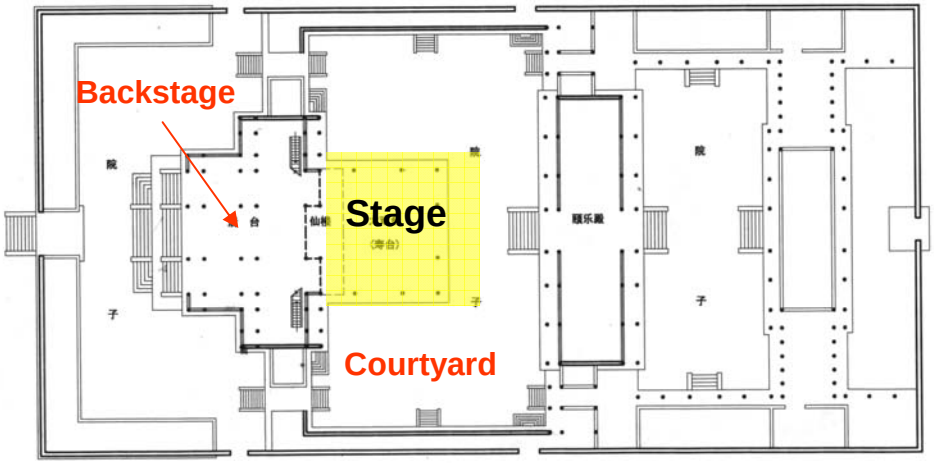
COURTYARD THEATRE

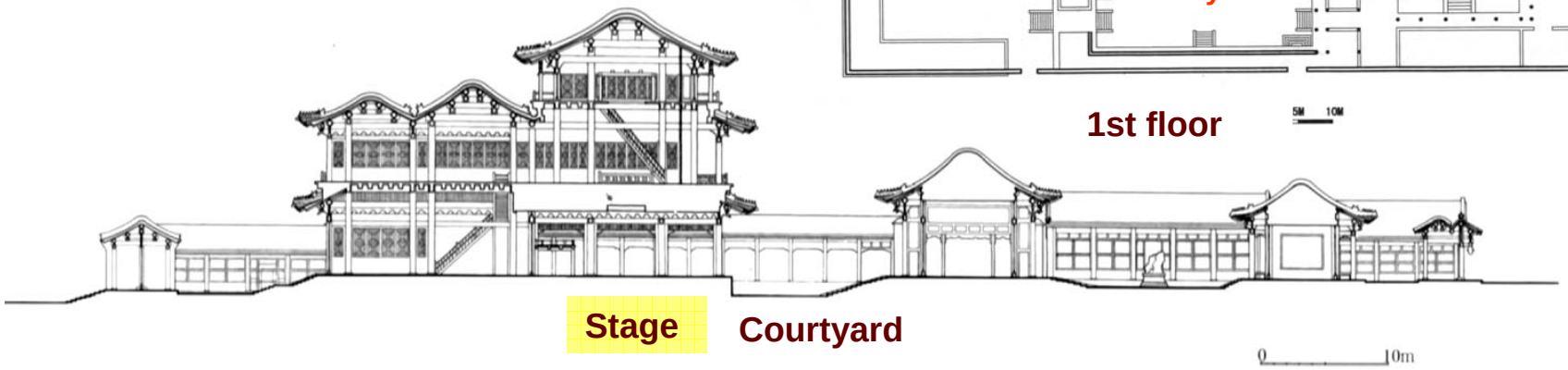


颐和园大戏楼

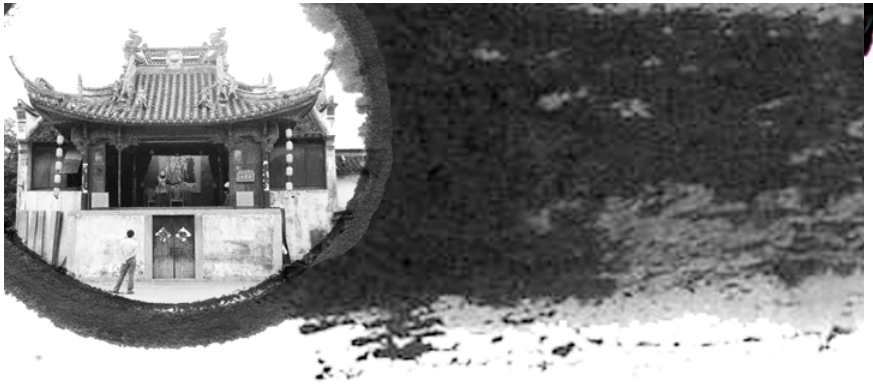
The Grand Theatrical Building, Summer Palace Beijing







The Grand Theatrical Building, Summer Palace, Beijing



THE GRAND COURTYARD THEATRE

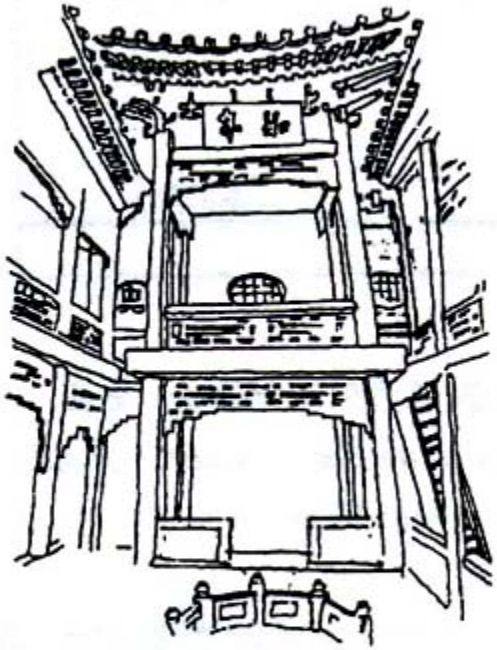
FORBIDDEN CITY, BEIJING

(A.D. 1776)

ONE OF THE LARGEST STAGES

STAGE AREA : 586 M2

RU-TING, Forbindden City, Beijing
World smallest COURTYARD THEATRE

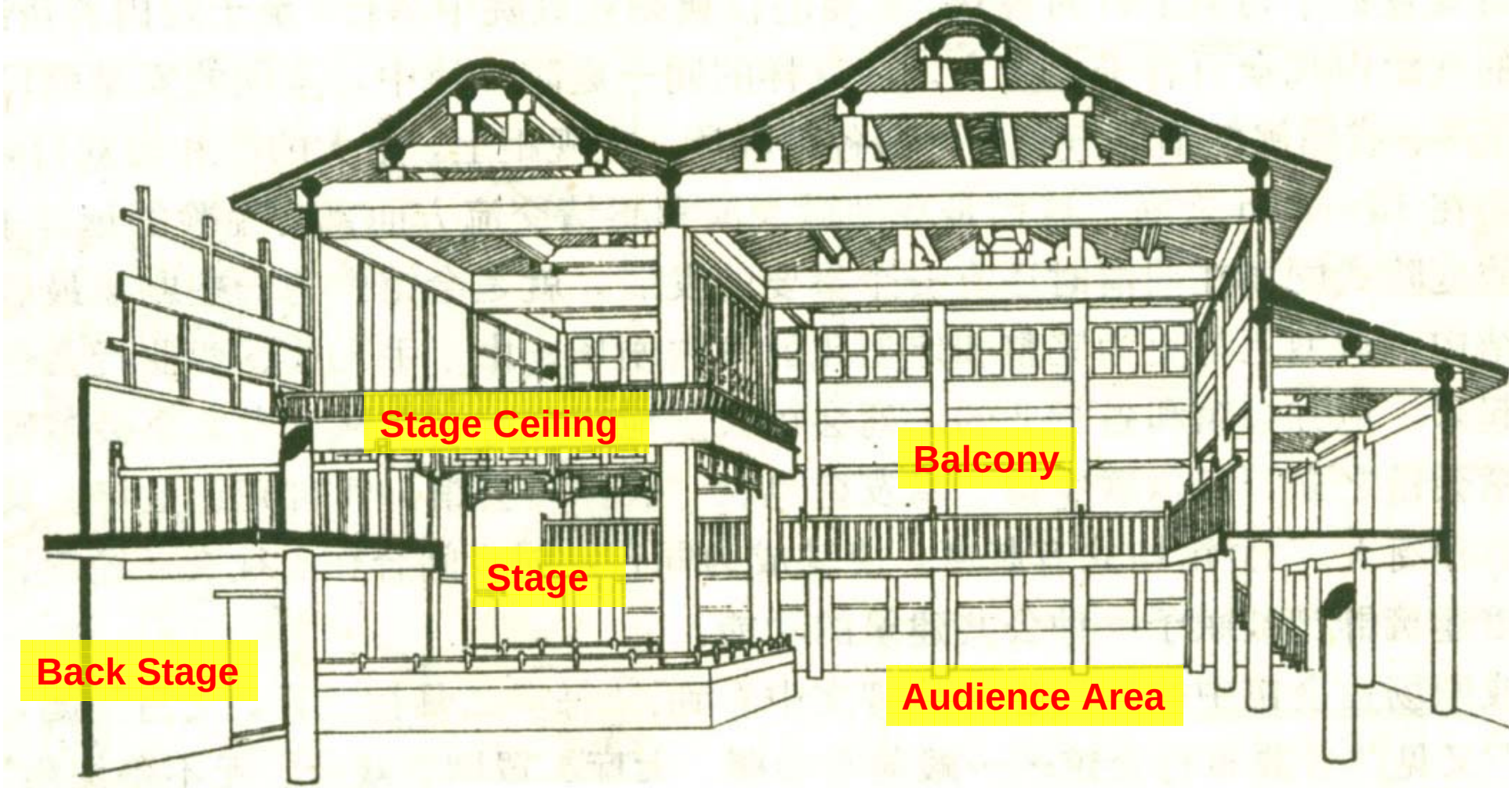


故宫“如亭”庭院式戏场平面

World smallest stage “Ru－ting” in the Imperial Palace, Beijing

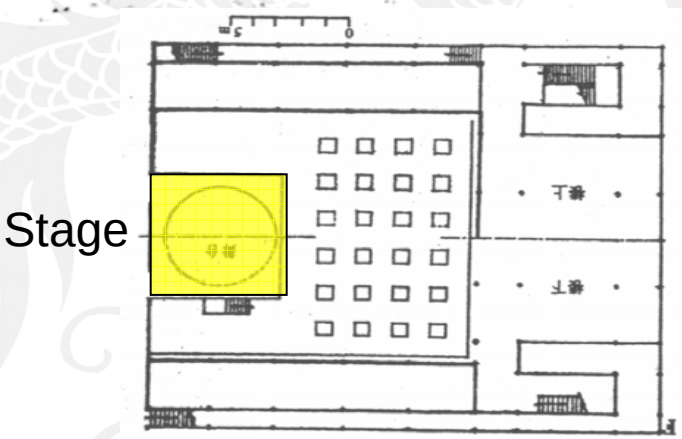
TINGLIGUAN THEATRE
Summer Palace, Beijing

AUDITORIUM THEATRE



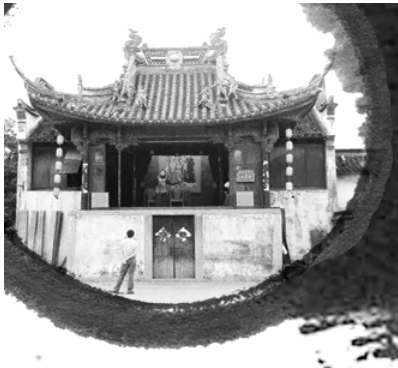
A Typical Section Drawing of a Theatre in 19th Century

AUDITORIUM THEATRE



天津广东会馆

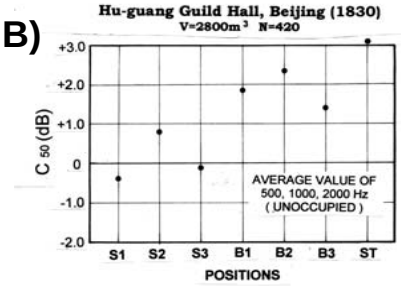
Guangdong Guildhall,
Tianjin (1905)



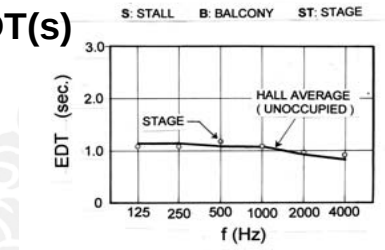
AUDITORIUM THEATRE

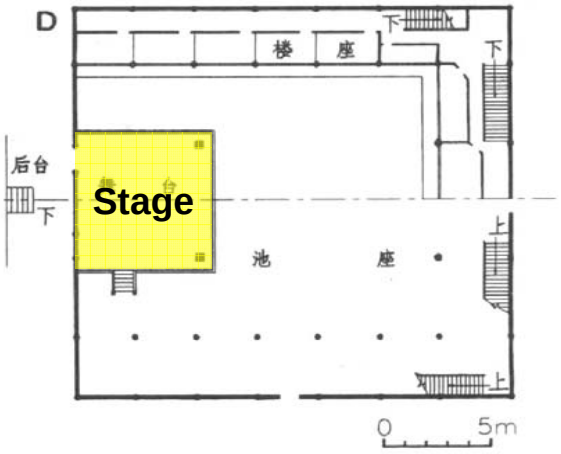
Huguang Guildhall， Beijing(1830)

C_{80}(dB)



EDT(s)

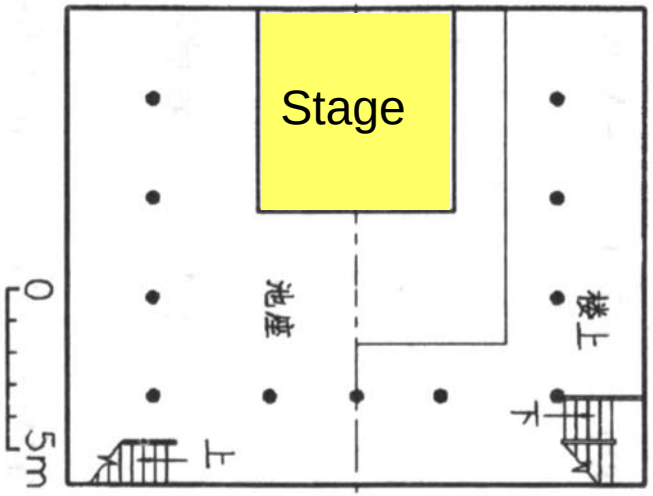




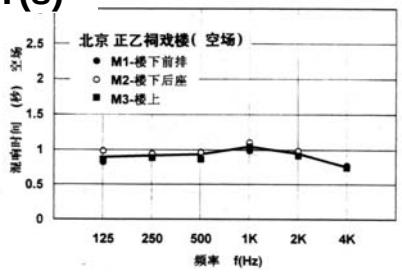
北京湖广会馆

AUDITORIUM THEATRE

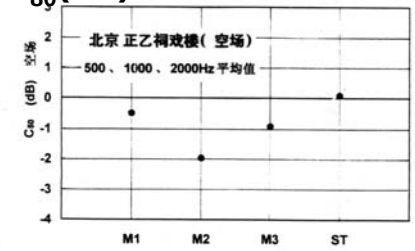
Zhengyici, Beijing (1792)

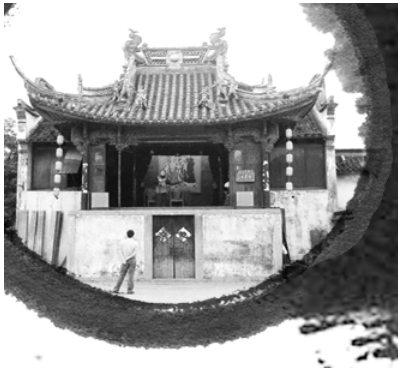


RT(s)



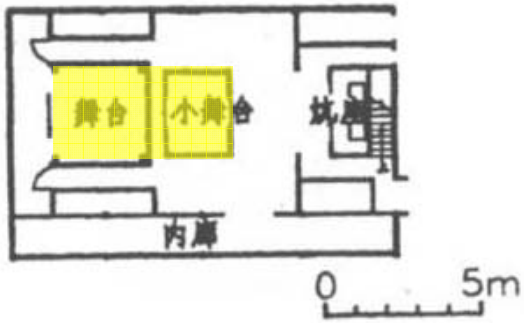
C_{80}(dB)



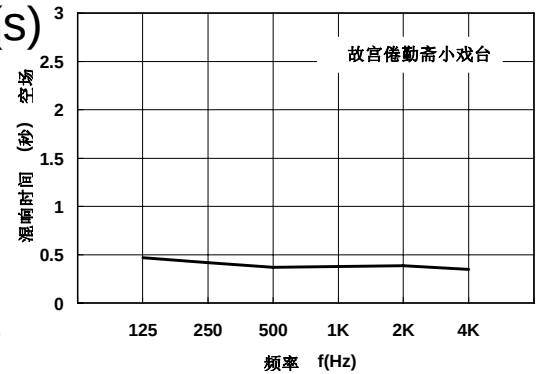


JUANQINZHAI, Forbidden City, Beijing

Stage

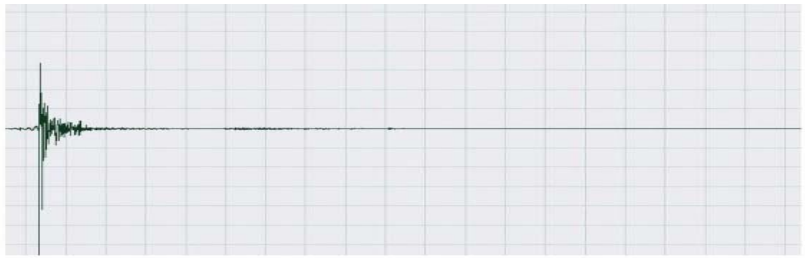


RT(s)



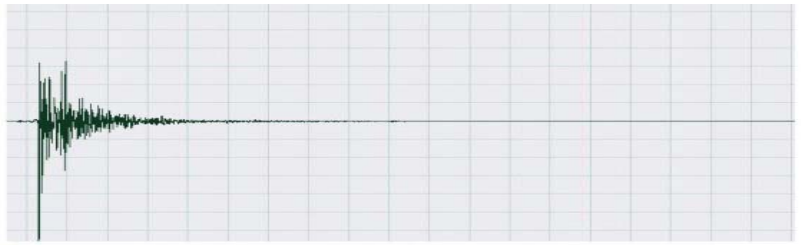
1:10 model test in an anechoic chamber

A



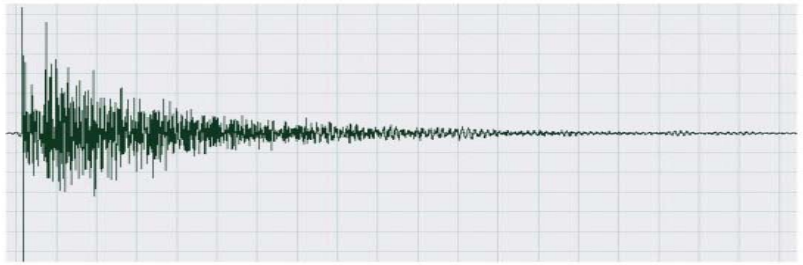
0.5 S

B



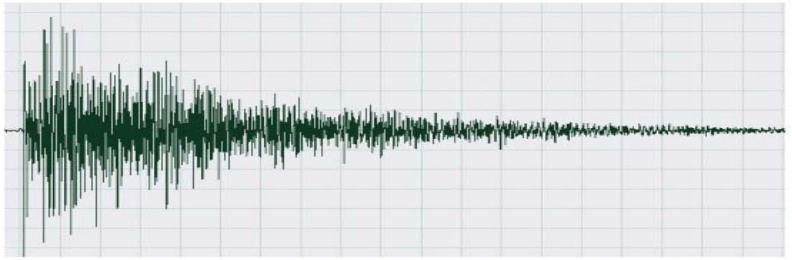
0.5 S

C



O 0.5 S

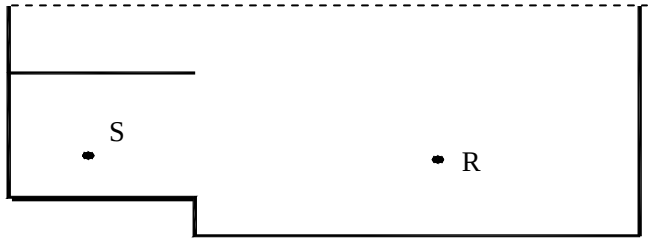
D



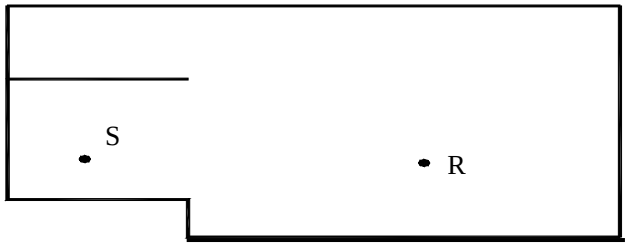
O 0.5 S

A. Open Air Stage

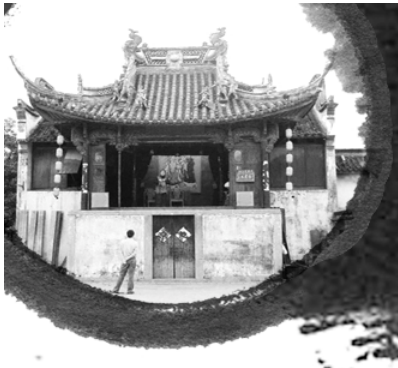
B. Open Air pavilion Stage



C. Courtyard Theatre

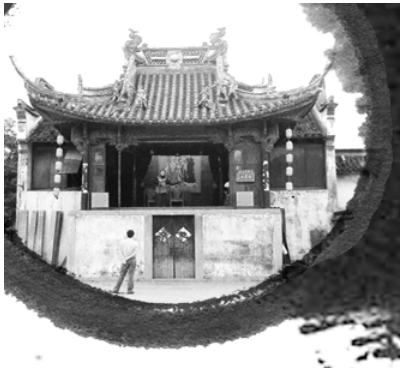


D. Auditorium



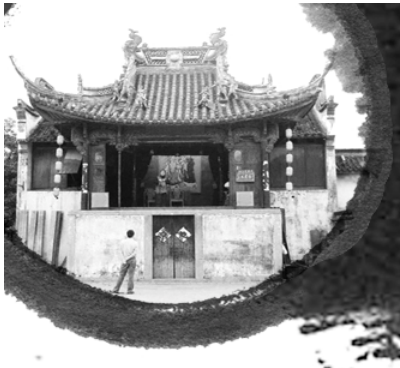
PART 3

ACOUSTICS OF COURTYARD THEATRES



ACOUSTICS OF COURTYARD THEATRES

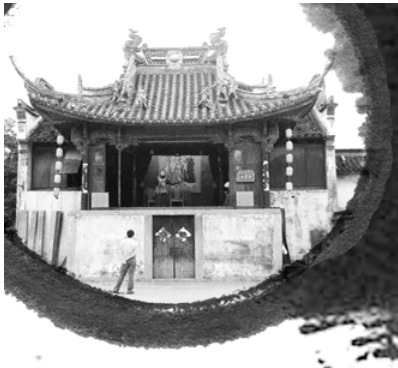
- **Courtyard Theatres were the prevailing form in the Traditional Chinese Theatrical Buildings. The absence of a roof means little reverberation and a non-diffuse sound field.**
- **Classic room acoustics, such as Sabine RT formula, is developed for an enclosed space, closed off on all sides.**
- **Does it still suitable for a non-enclosed space, or an *open-top space ?***

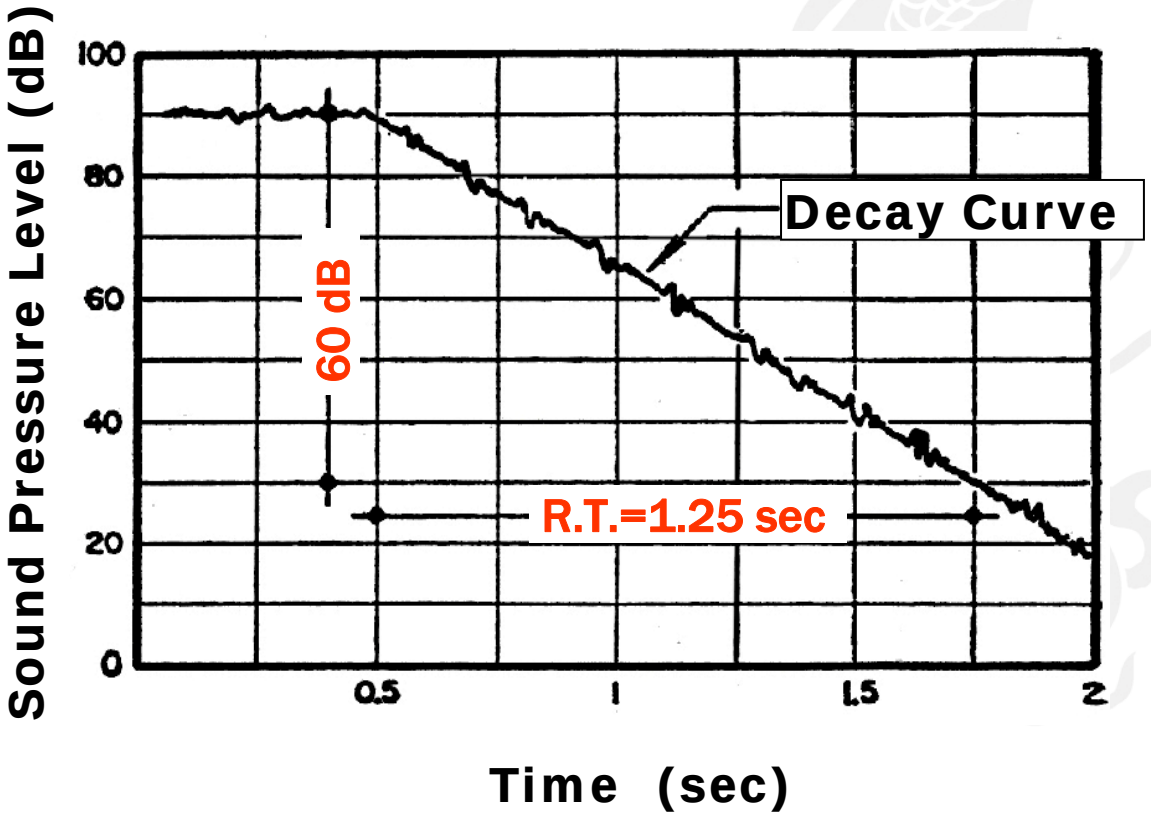


ACOUSTICS OF COURTYARD THEATRES

- Reverberation means the persistence of sound in an enclosed space after a source of sound has stopped.
- Reverberation Time (RT) defined by Sabine at the end of 19th century is the time required for sound pressure level to decrease 60 dB after the source has stopped.
- RT usually is expressed as T_{60}.

ACOUSTICS OF COURTYARD THEATRES



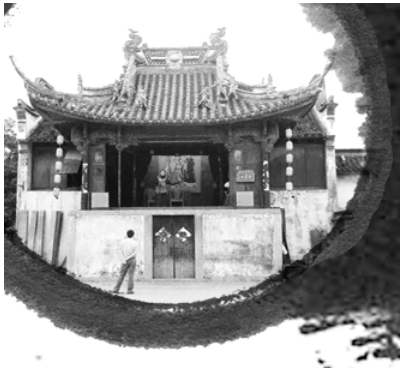


Sabine Eq.

$$T = \frac{0.16V}{A}$$

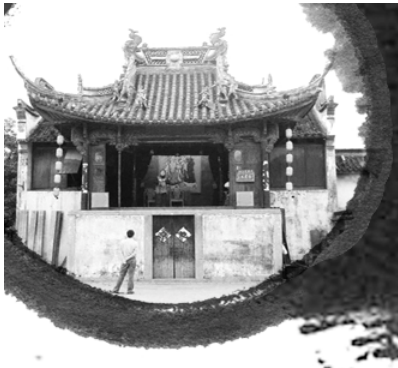
V - Volume (m^3)

A - Absorption (m^2)



Sabine Formula Only For

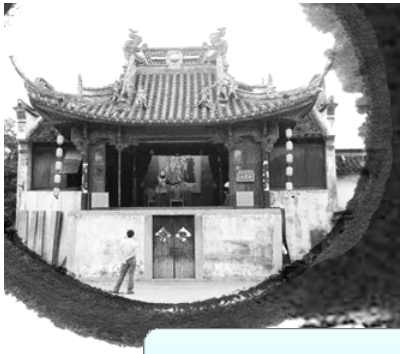
- An enclosed space
- A diffused sound field
- A live room with low absorption



Absorption in A Room

- he absorbing power **A** of the room is measured in open-window units.
- m^2 open-window means a unit of absorption, i.e., 100% of the incident sound at that area escaped from the enclosure, no reflections to the room.

ACOUSTICS OF COURTYARD THEATRES

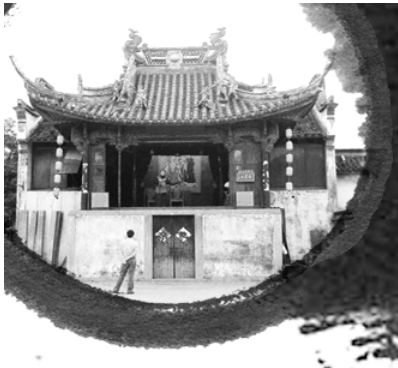


Example: W=13m, L=20m, H=5m, V=1300m3

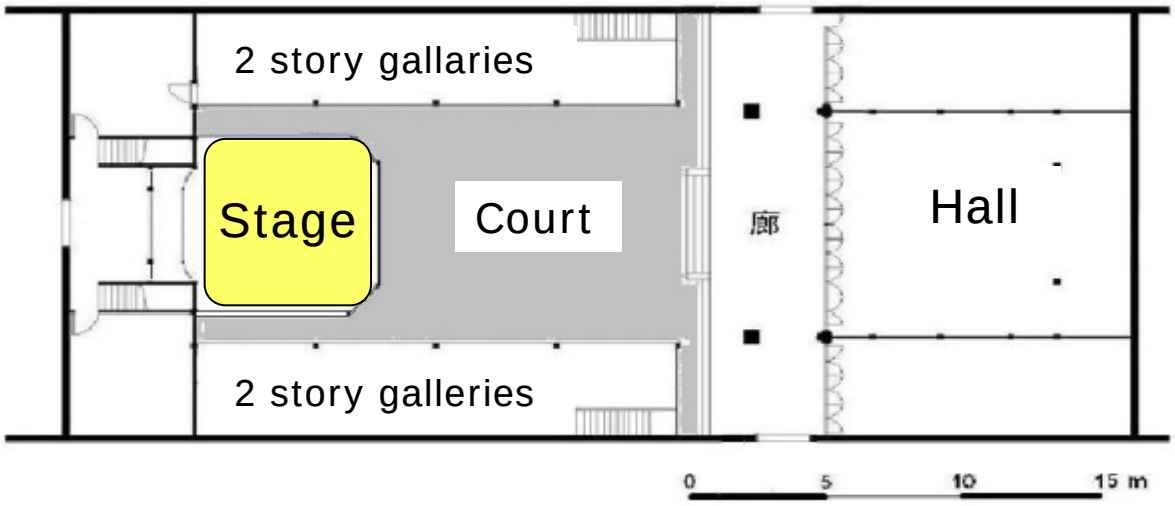
		w/ roof	no roof
Ceiling	130 m²	α =0.35	α =1.00
Floor	130 m²	α =0.20	α =0.10
End walls	130 m²	α =0.35	α =0.10
Sidewalls	200 m²	α =0.30	α =0.10
Tot. absorption ΣA		177 m²	176 m²
R T		1.2 S	1.2 s

Acoustics of these two cases (spaces with and without roof) might be different, even their RTs show the same.

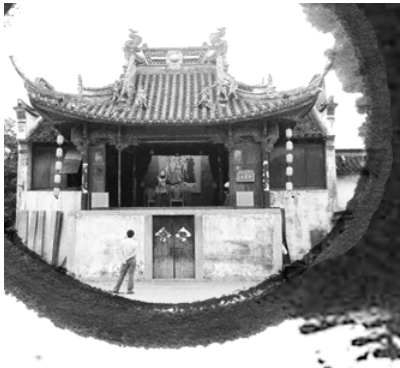
ACOUSTICS OF COURTYARD THEATRES



A typical courtyard theatrical building, Sanshan Gild House, Shanghai (1905)

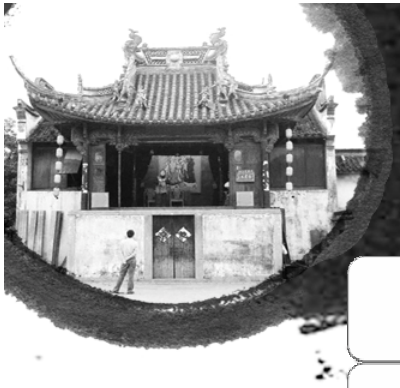


Acoustics of Courtyard Theatres



Sanshan Gild House

Shanghai, 1905

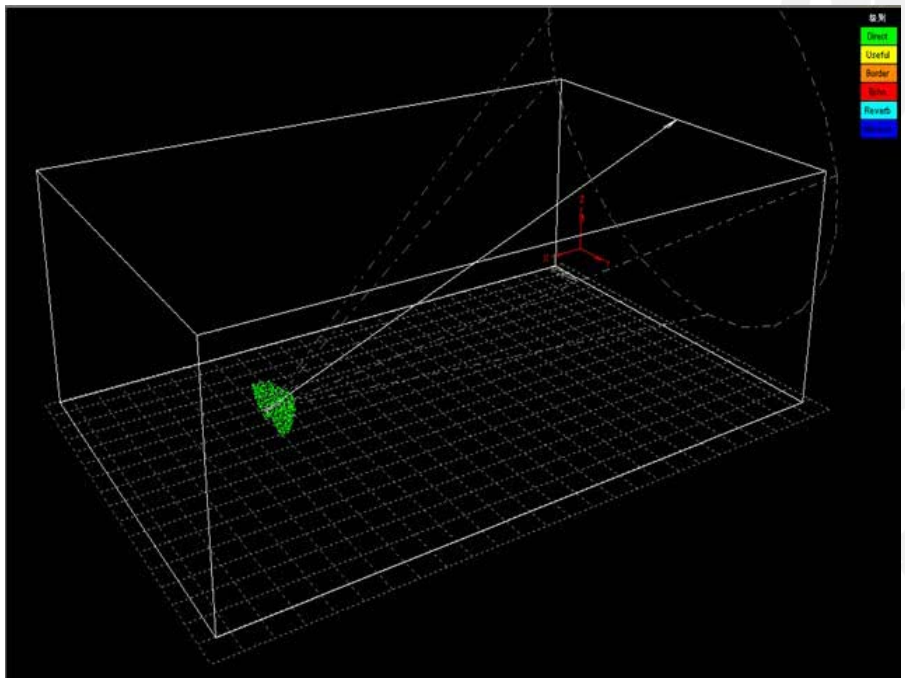


Acoustics of Courtyard Theatres

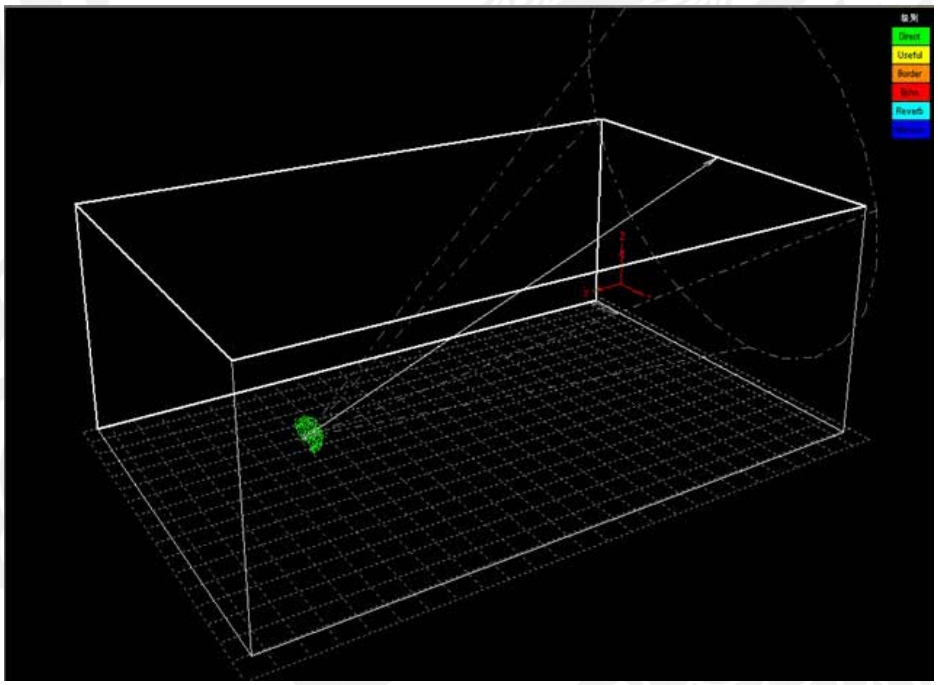
3D Animated Ray Progression

Animated rays in progress from 0 ms to 200 ms

Top open



Top closed

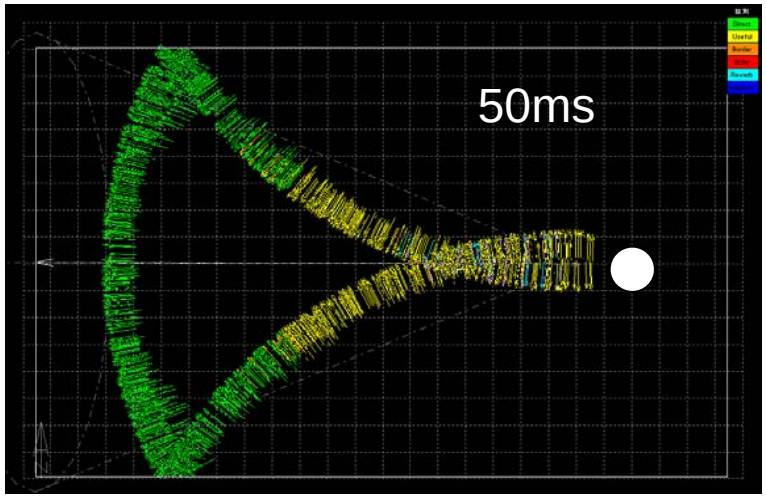


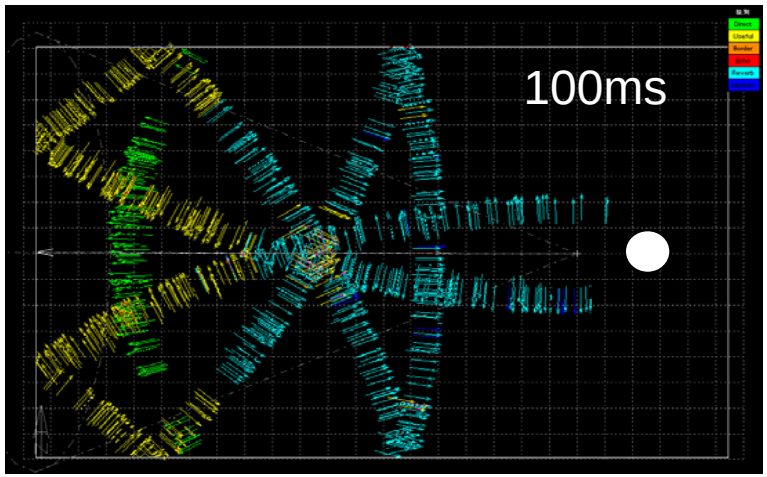
3D sound distributions for spaces with or without ceiling

(animated rays shown in plan)

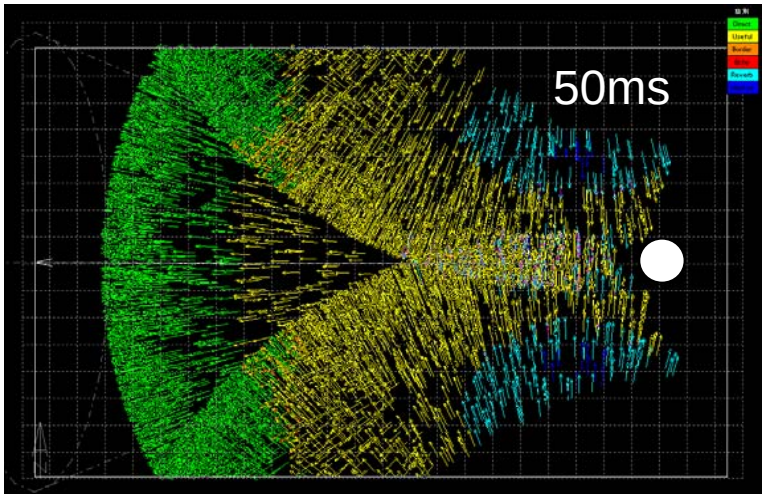
simulated by Ecotect Software

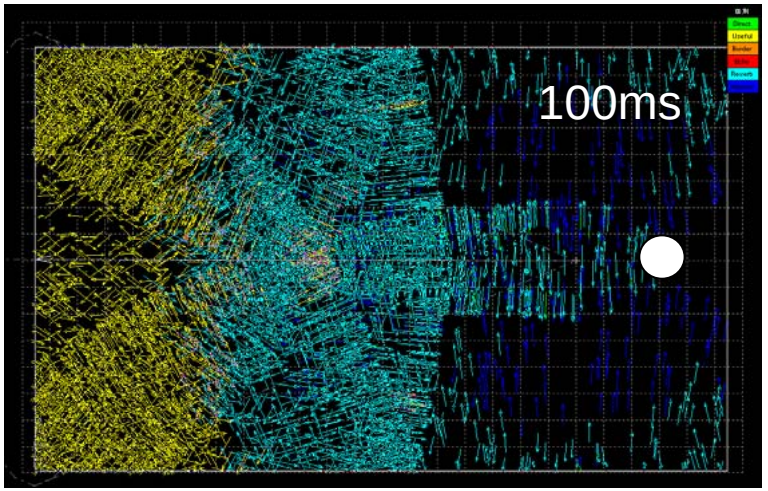
Top opened





Top closed

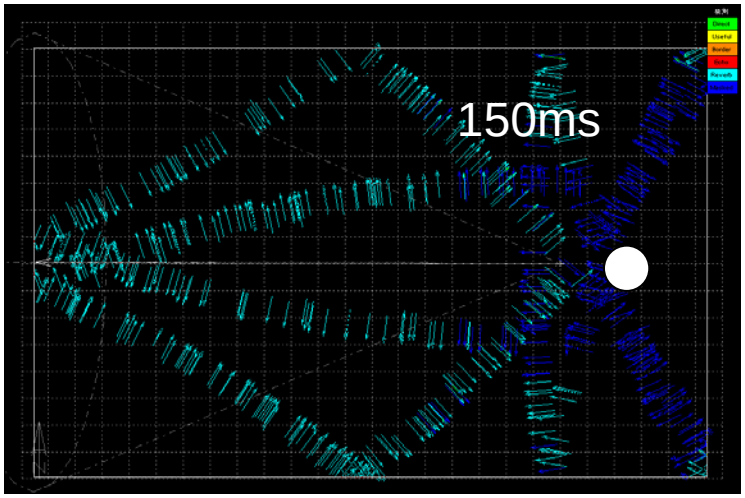


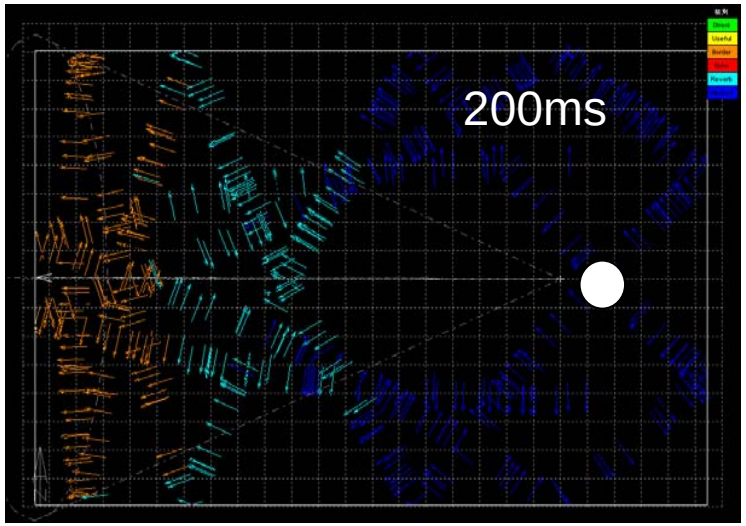


3D sound distributions for spaces with or without ceiling

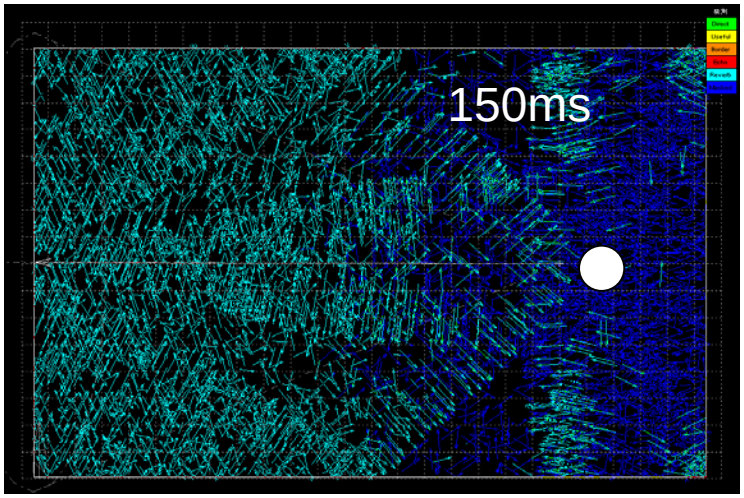
(animated rays shown in plan)

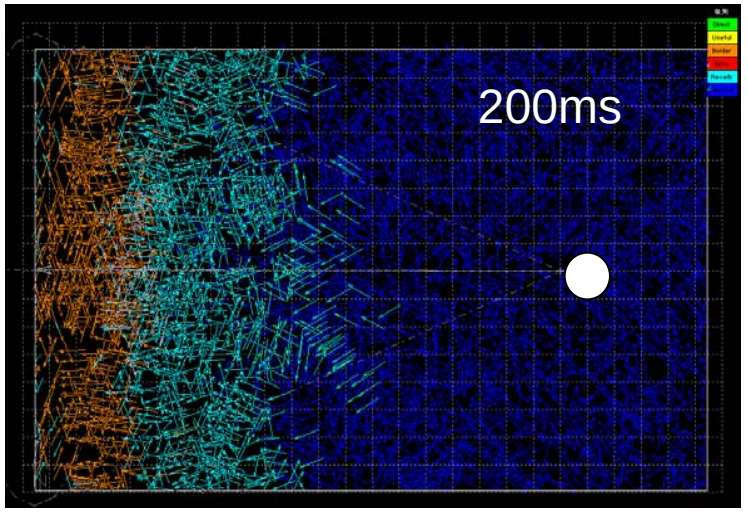
Top open





Top closed

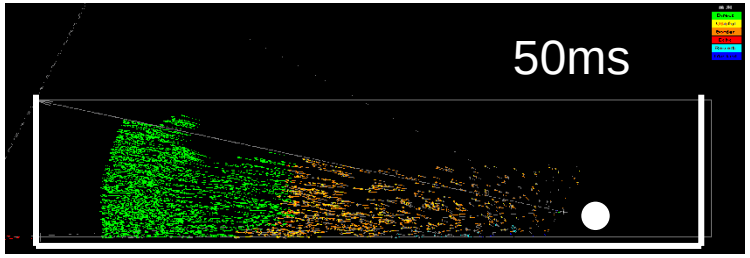


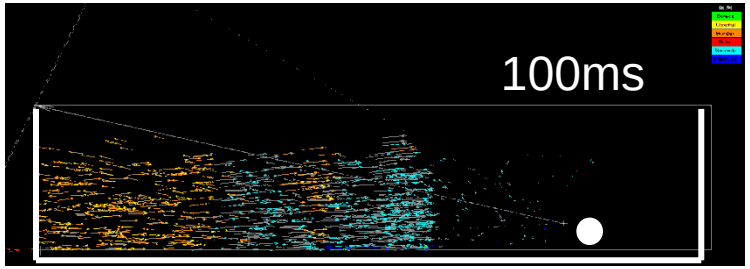


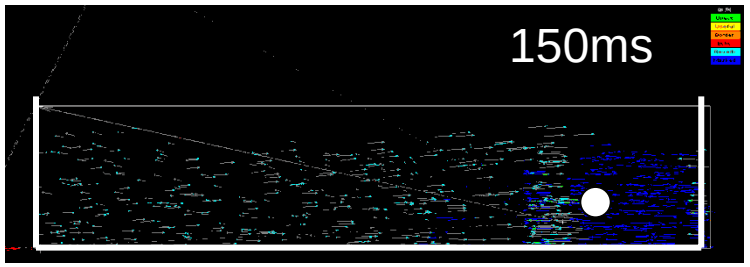
3D sound distributions for spaces with or without ceiling

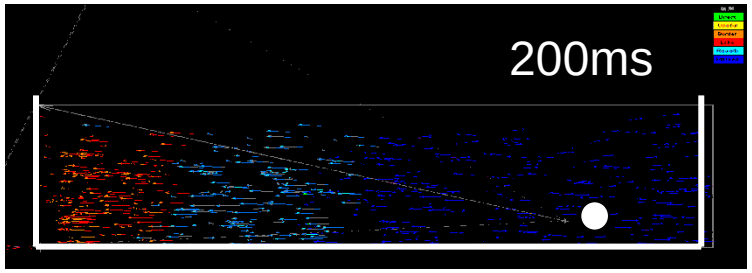
(animated rays shown in section)

Top open

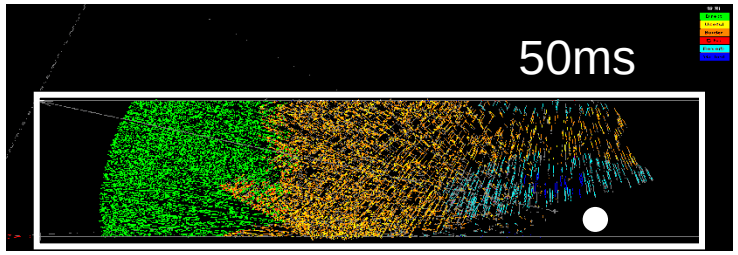


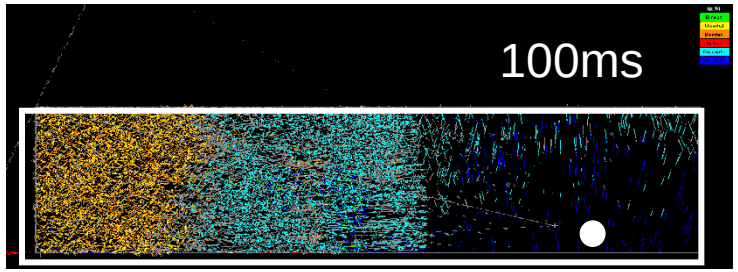


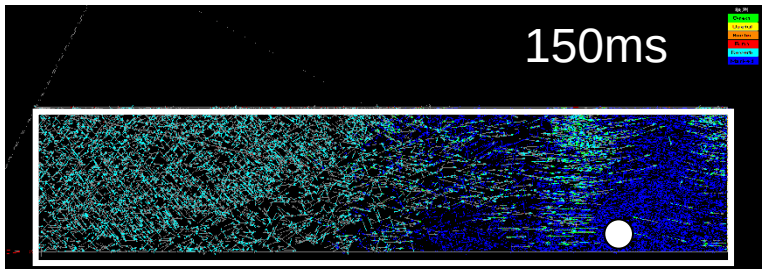


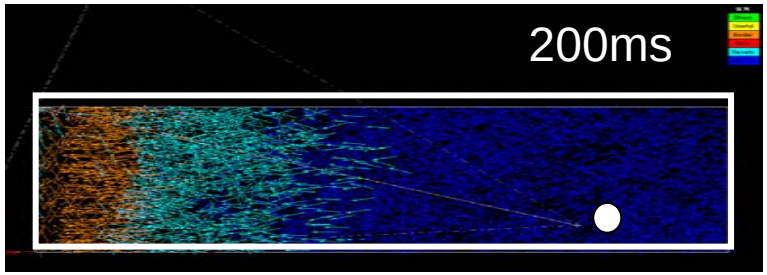


Top close





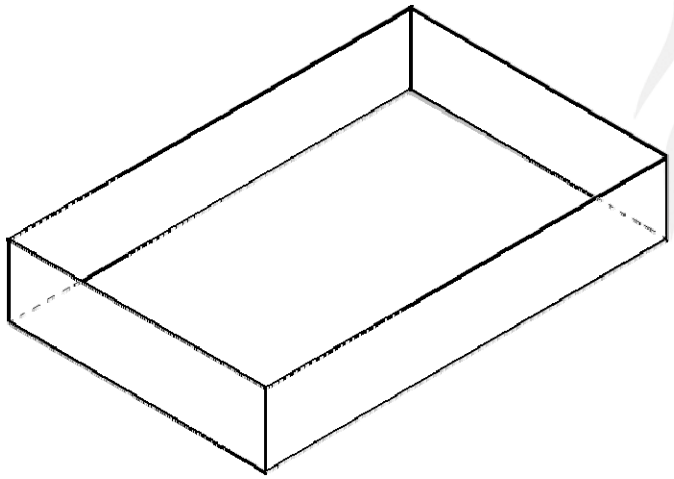




ACOUSTICS OF COURTYARD THEATRES

Comparison of following two cases

Example space : 25m×16m×4.5m

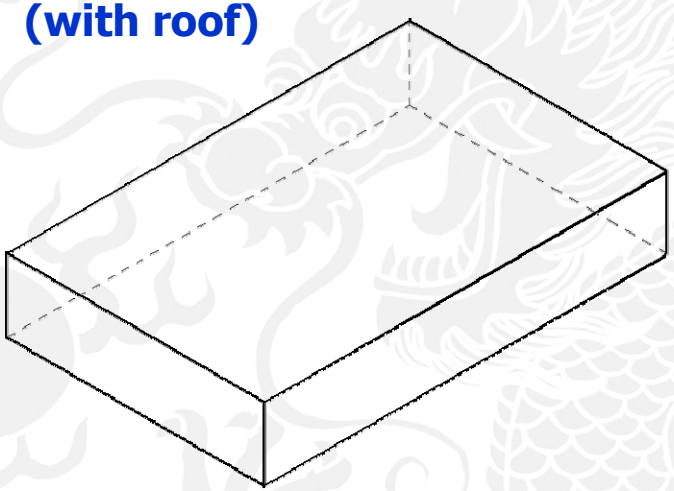


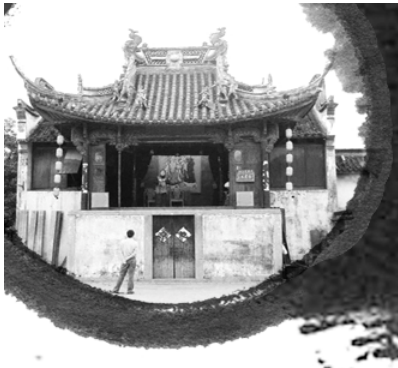
Top-Open Space (no roof)

(open area / Total surface area = 34%)

Enclosed Space

(with roof)

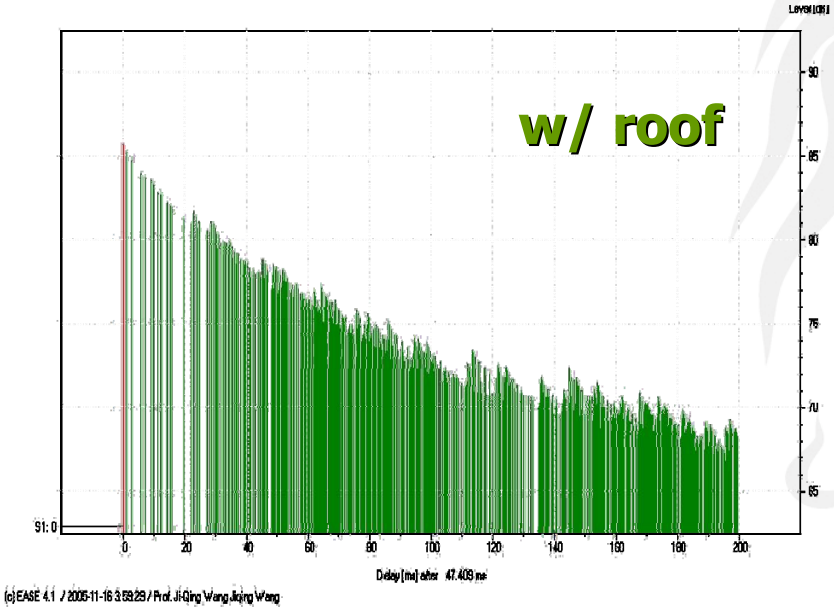


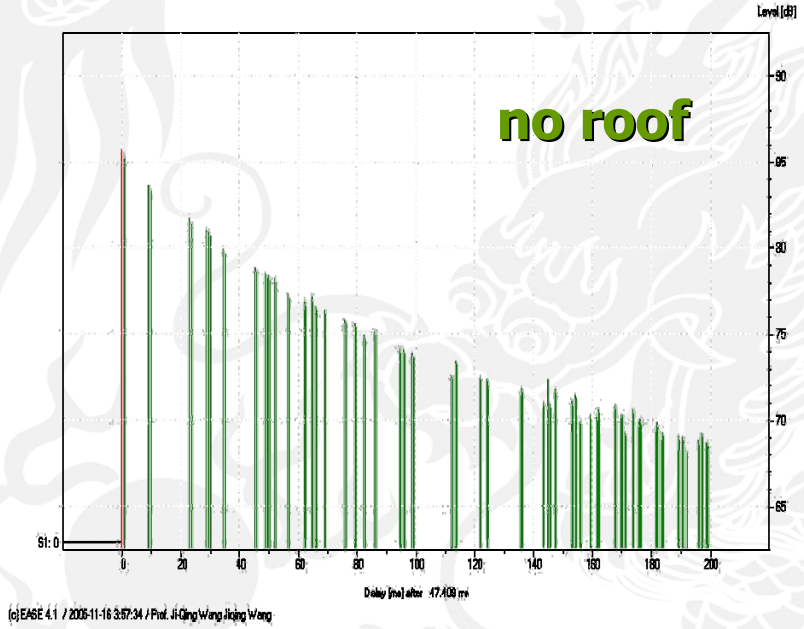


ACOUSTICS OF COURTYARD THEATRES

Example space : 25m×16m×4.5m

Impulse Responses





- T30 (-5dB — -35dB) shows little difference – similar decay rate
- Fine structures of both echograms show significant difference

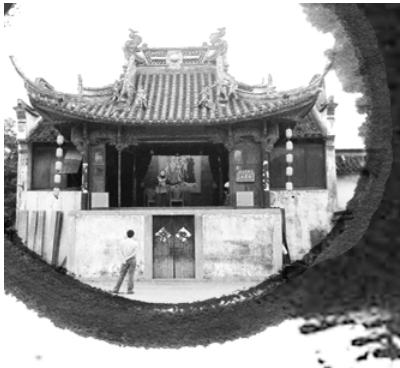
ACOUSTICS OF COURTYARD THEATRES

Comparison of Normal Modes

Example: 15m×25m，H=4.5m，number of normal modes calculated at the center frequency with a band width of 10 Hz，

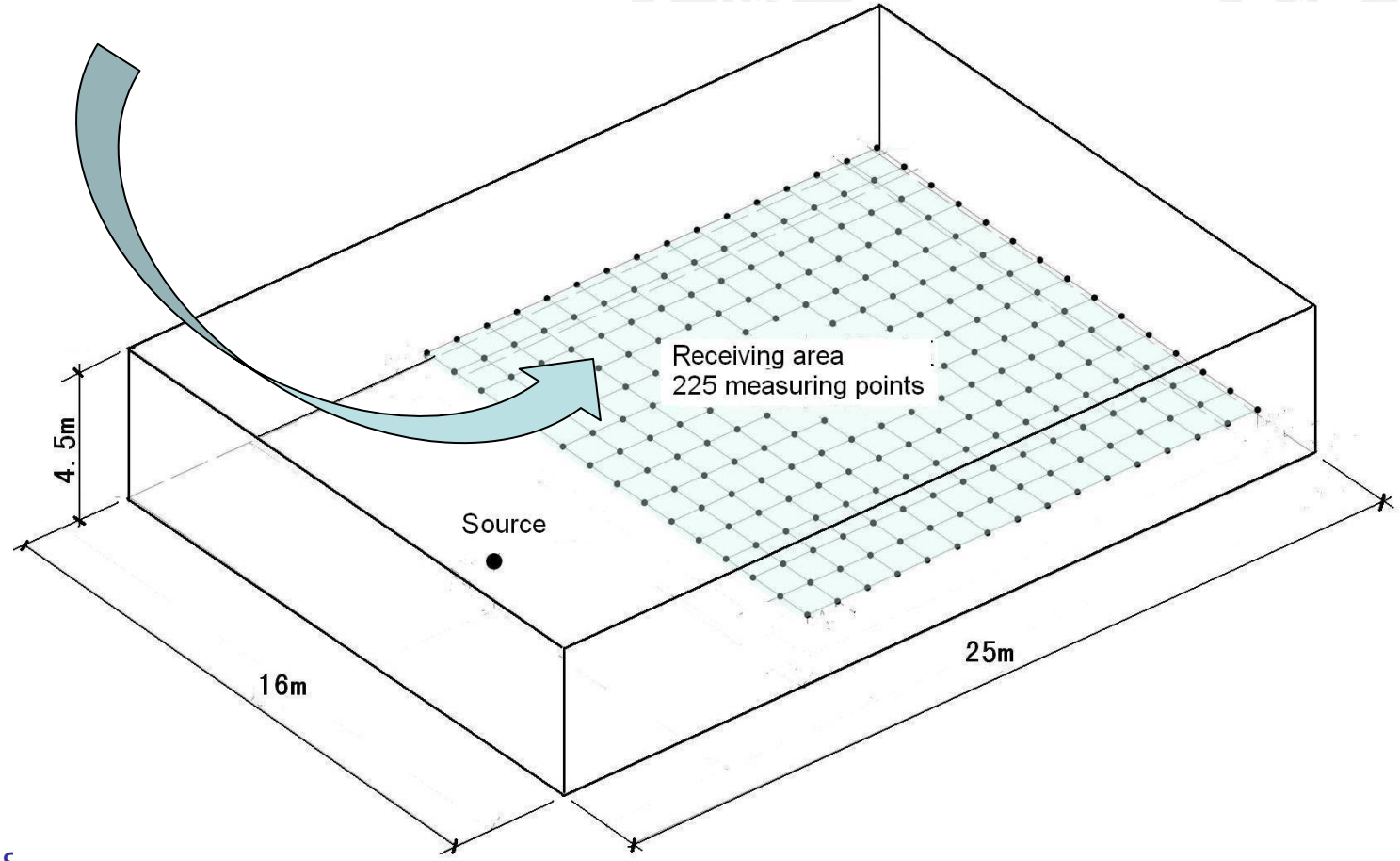
Number of Normal Modes Calculated

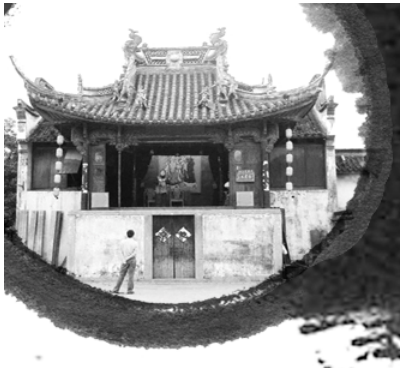
	63Hz	125Hz	250Hz	500Hz	1000Hz	2000Hz
A w/ roof	29	103	385	1490	5856	23223
B no roof	20	63	213	786	3011	11778
（A-B）/ A Lost factor	31%	40%	45%	47%	48%	49%



ACOUSTICS OF COURTYARD THEATRES

225 Receiving Points @ 1m apart for Digital Simulation





ACOUSTICS OF COURTYARD THEATRES

Example : 25m×16m×4.5m

- T30 (s) **Calculated Median**

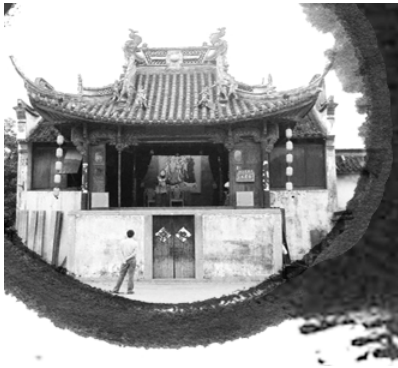
w/ roof	2.45 s	**84 % at** ± 0.1 s
no roof	1.66 s	**63 % at** ± 0.1s

T30 – RT calculated from -5 dB to -35 dB decay

- EDT (s) **Calculated Median**

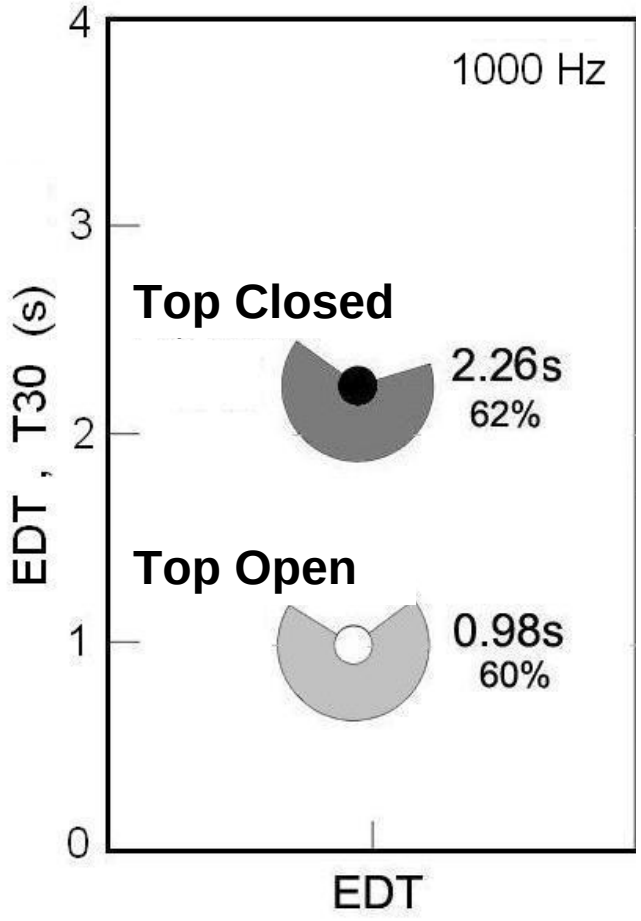
w/ roof	2.26 s	**62 % at** ± 0.1 s
no roof	0.98 s	**60 % at** ± 0.1 s

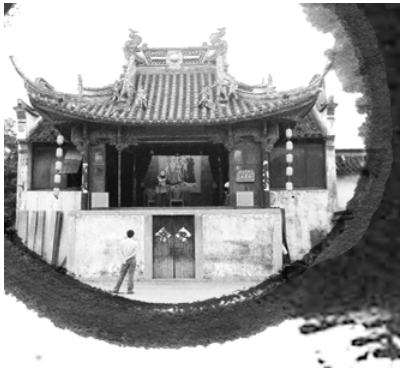
EDT – Early Decay Time, RT calculated from first 10 dB decay



ACOUSTICS OF COURTYARD THEATRES

Example : 25m×16m×4.5m





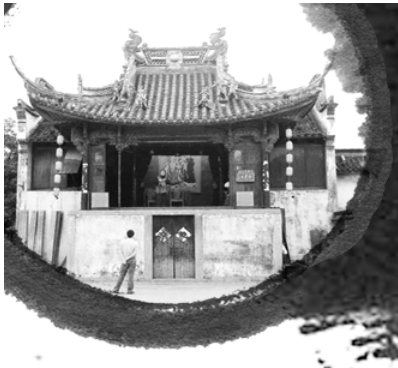
ACOUSTICS OF COURTYARD THEATRES

Example : 25m×16m×4.5m

- G **Calculated Median**

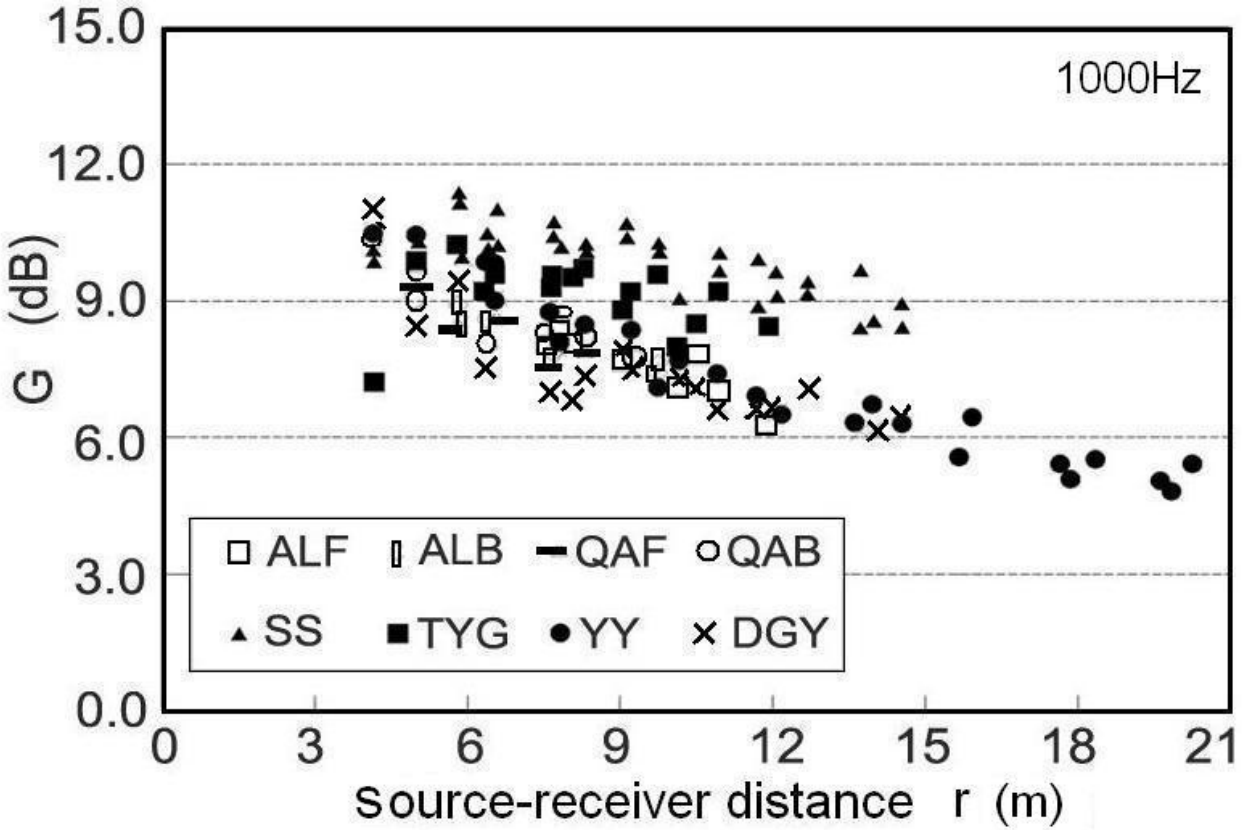
w/ roof	6.4dB	**70 %** **at** ± 0.1s
no roof	2.4dB	**38 %** **at** ± 0.1s

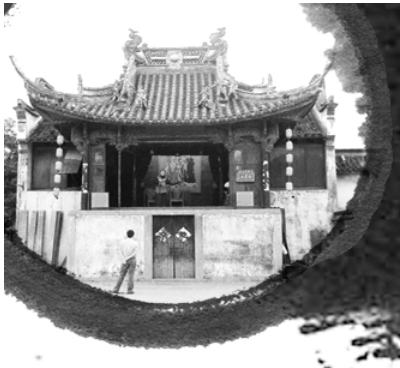
G – Strength factor



ACOUSTICS OF COURTYARD THEATRES

ATTENUATION OF STRENGTH FACTOR G (dB) vs. DISTANCE *r* FROM SOURCE MEASURED IN EIGHT COURTYARD THEATRES

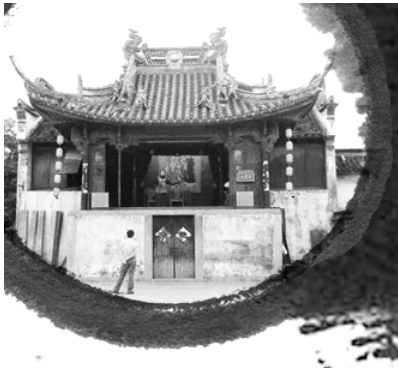




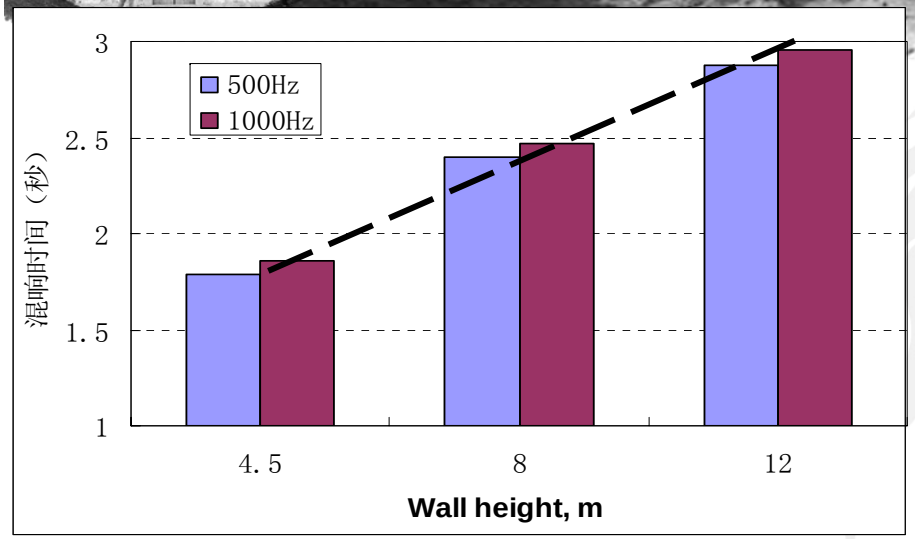
ACOUSTICS OF COURTYARD THEATRES

Effects of Surrounding Wall Height for a Open-Top Space

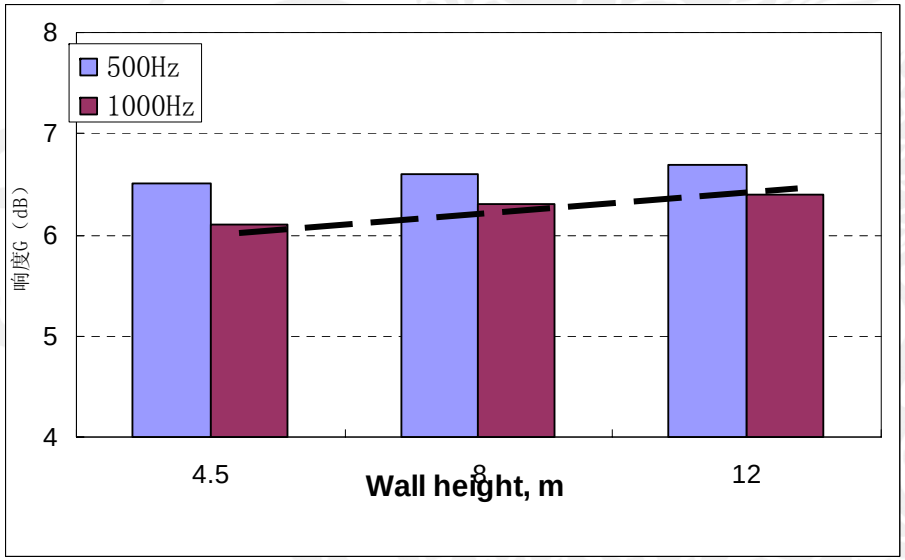
	RT ’	
Wall Height	**500Hz**	**1000Hz**
H = 4.5m	**1.79 s**	**1.86 s**
H = 8m	**2.40 s**	**2.47 s**
H = 12m	**2.88 s**	**2.96 s**



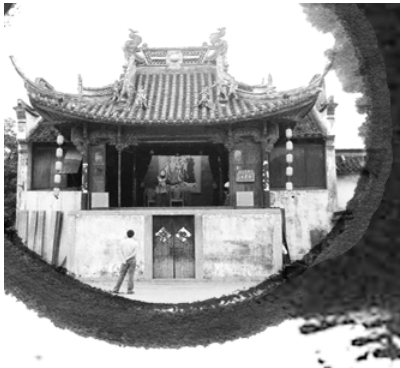
Effects of Surrounding Wall Height for a Top Open Space



More effects on RT ’



Less effects on G



ACOUSTICS OF COURTYARD THEATRES

- Do the acoustic results can be predicted by classic equations ?
- No!

- Actual results are far from predictions by following eqs, as these eqs. are valid only for diffused sound field.

RT equation : $$T = 0.163\ V\ /(S\alpha)$$

SPL distribution equation: $$L_p = L_w + 10\lg\left(\frac{1}{4\pi r^2} + \frac{4}{R}\right)(dB)$$

- Their reverberant effects are also differ significantly even with same predicted RT values.

ACOUSTICS OF COURTYARD THEATRES

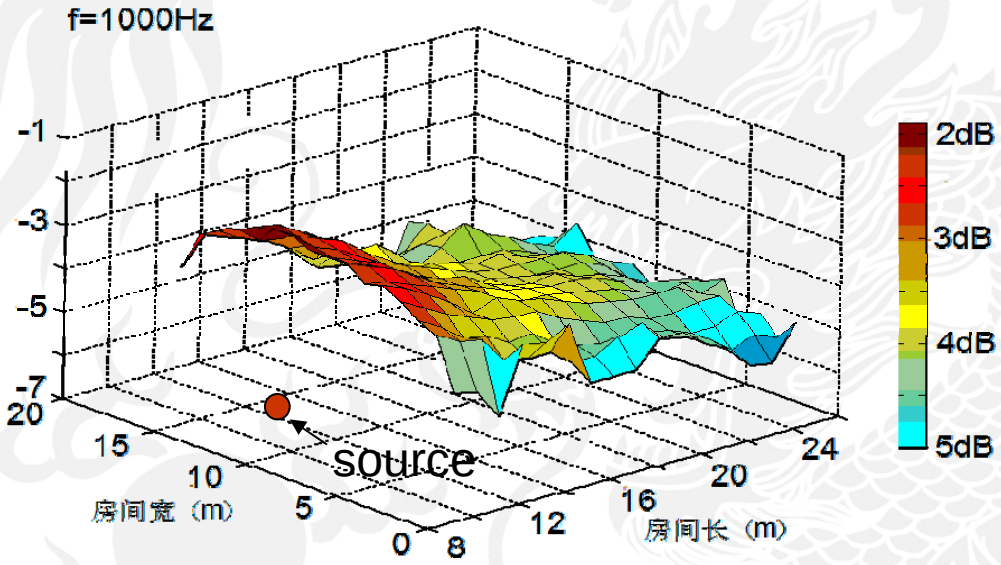
G differences (dB) for the spaces w/ & w/no roof

Receiving area 15m ×15m @1m ×1m, h=1m

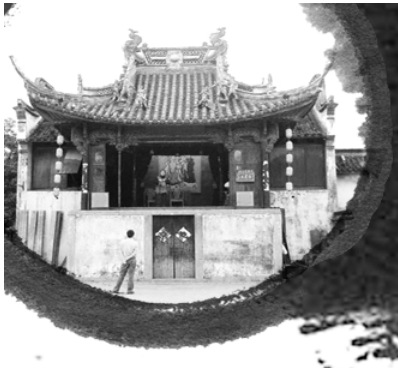
15m×25m，H=4.5m

Simulated by Odeon software

Source （ 4, 9, 1.5 ）

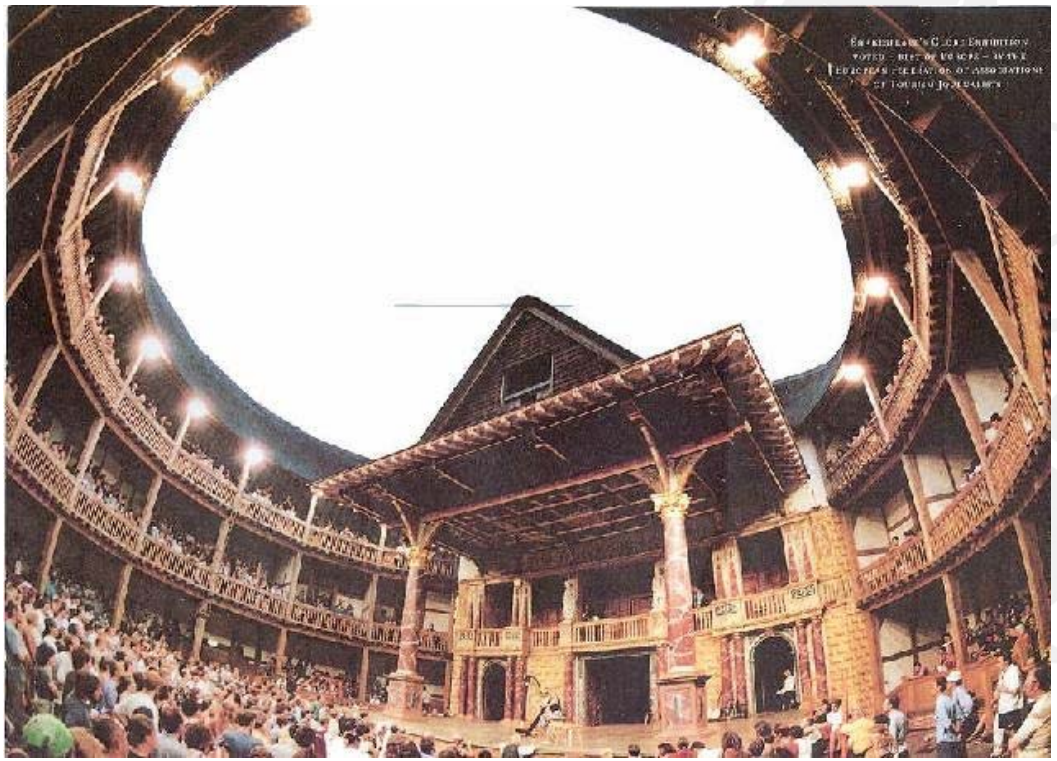


- G drops due to lost all reflections from ceiling
- G drops much more at rear area(>4dB)
- SPL distribution therefore becomes more uneven



ACOUSTICS OF COURTYARD THEATRES

- **Global Theatre (Shakespearean theatre), London,1614**



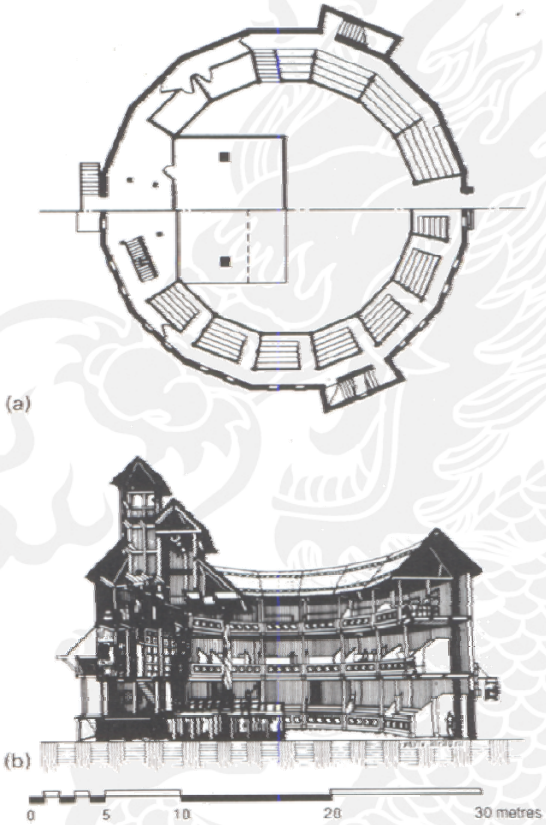
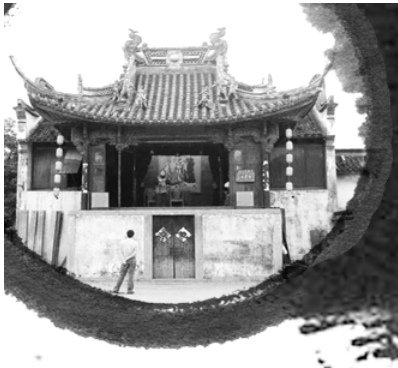


Figure 8.6 (a) Plan and (b) longitudinal perspective section of a Shakespearean theatre, London.

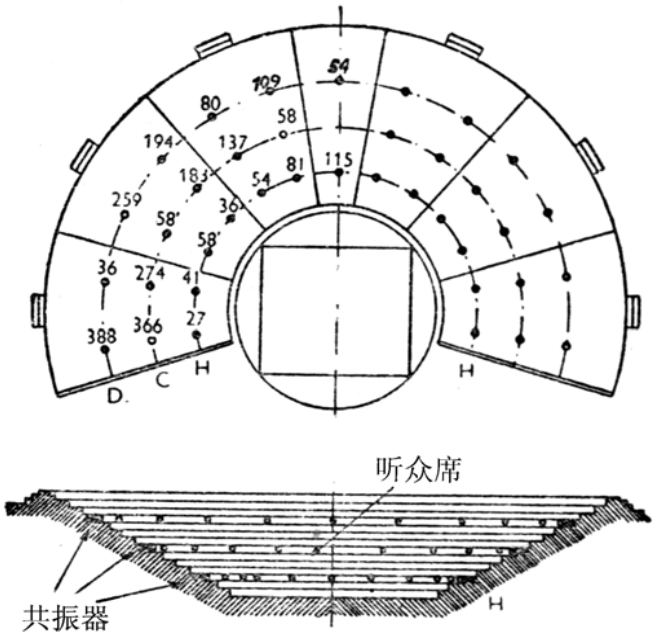
ACOUSTICS OF COURTYARD THEATRES

Global Theatre, London, 1614 (rebuilt 1923)



ACOUSTICS OF COURTYARD THEATRES

Ancient Greek & Roman Theatres



ACOUSTICS OF COURTYARD THEATRES

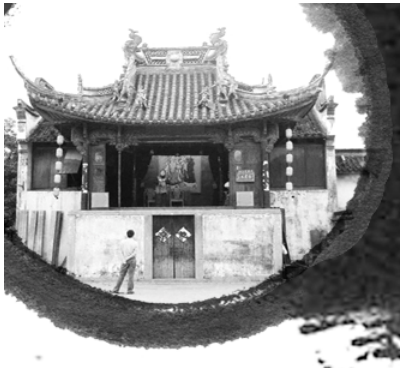
Ancient Greek & Roman Theatres

- **RT test results in three ancient open-theatres in Greece**

	Capacity	RT
Epidaurus	**14,000**	**0.2 sec**
Dodoni	**17,000**	**0.18 sec**
Odeion	**2,300**	**0.13 sec**

- ***LITTLE REVERBRANCE PERCEIVED*** **in these theatres reported by the *investigators***

Vassilantonopoulos S.L., et al., A study of ancient Greek and Roman theater Acoustics ACTA ACUSTICA / ACUSTICA, Vol.89 (2003) 123-136.

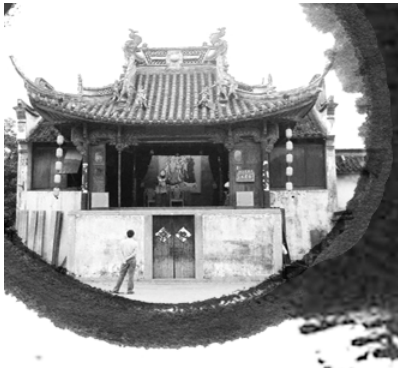


ACOUSTICS OF COURTYARD THEATRES

Ancient Greek & Roman Theatres

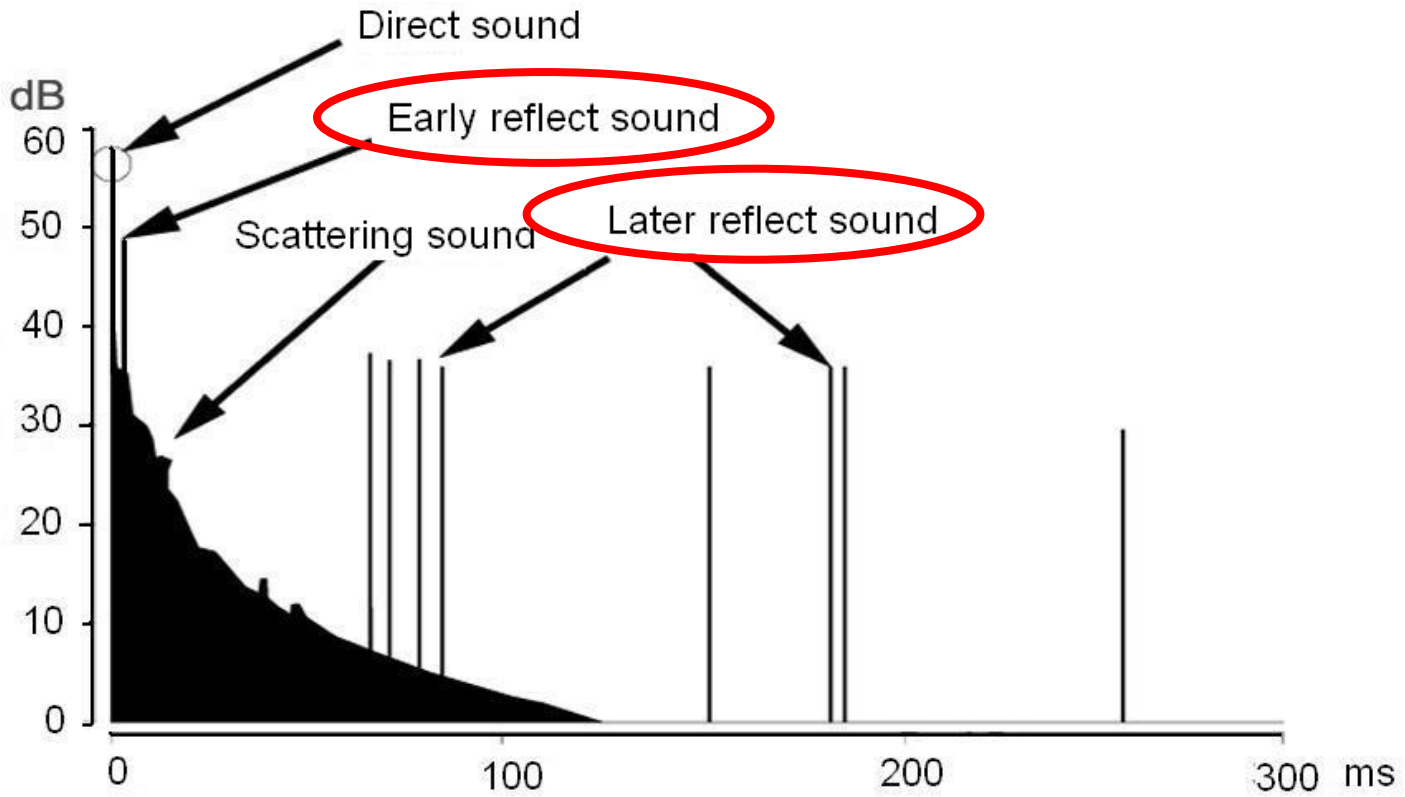
Greek Theatre in Segesta, Italy

- **Capacity : 4, 000**
- **Measured RT : 0.4 sec (mid-frequency)**
- ***Little reverbrance***
- **A. Daniele, M. Guilo, et al., A study of the acoustic qualities of the ancient theatre in Segesta. Proc. ICA 2004, Japan, Part III, 2349-2352.**



ACOUSTICS OF COURTYARD THEATRES

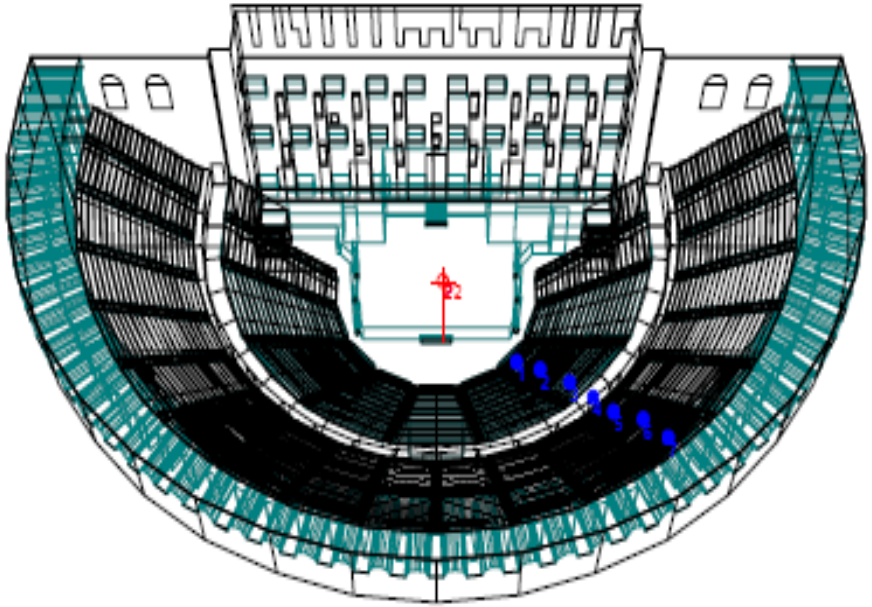
Echogram in Epidauros Theatre (T= 0.2 s)

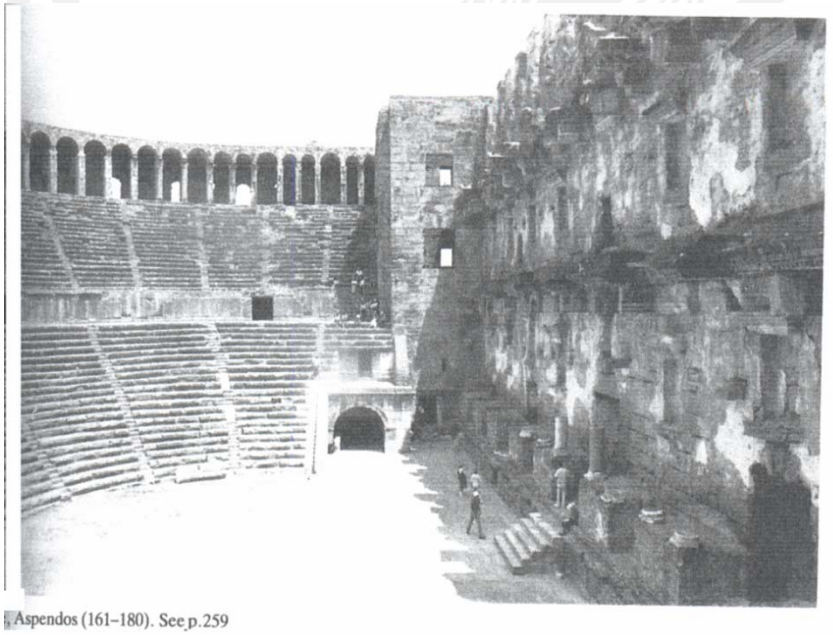


ACOUSTICS OF COURTYARD THEATRES

Aspendos Roman Theatre, Turkey

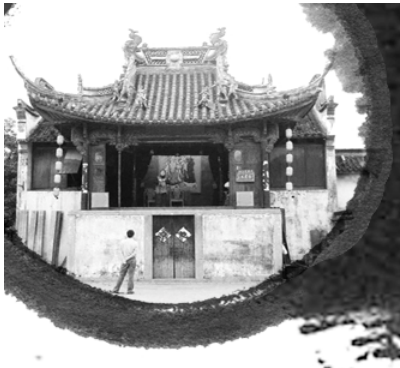
Field measurement & Odeon simulation : RT = 1.8 s ! ?





Aspendos (161–180). See p.259

Gade A C, Lisa M, et al., Roman Theatre acoustics: Comparison of acoustic . measurements and simulation results from the Aspendos Theatre, Turkey. Proc. ICA 2004, IV-2953-56.



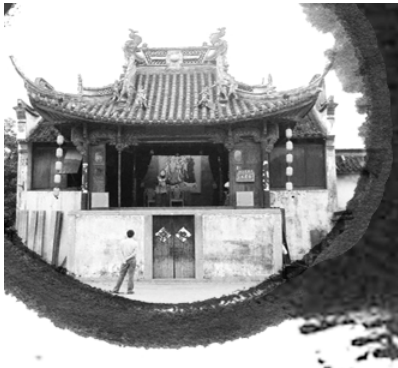
ACOUSTICS OF COURTYARD THEATRES

Questions For The Test And Simulation

Aspendos Theatre, Turkey (Gade et al, 2004)

Theatre diameter: 59m Capacity : 7,000 seats

- Measured SPL attenuation vs. distance very close to that in a free field
- *Little reverberance* was reported by the investigators
- WHY the measured RT and simulated RT by Odeon both reach as high as 1.8 sec ！？



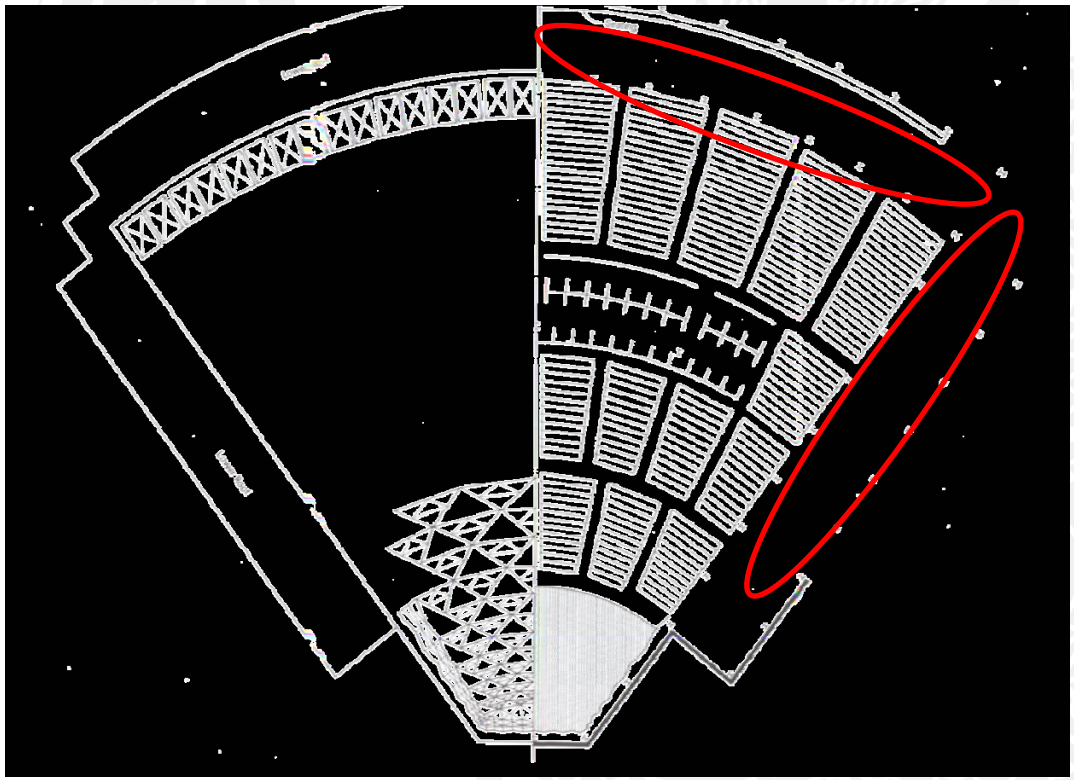
ACOUSTICS OF COURTYARD THEATRES

Tanglewood Music Shed, MA , USA

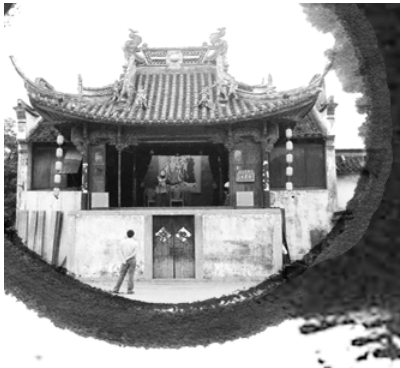
(V = 42,000m2, N = 5100)

Open area at side and rear walls less than 8% of total hall surface approx.

Mid freq occup. RT = 1.9 sec
Good reputation in acoustics



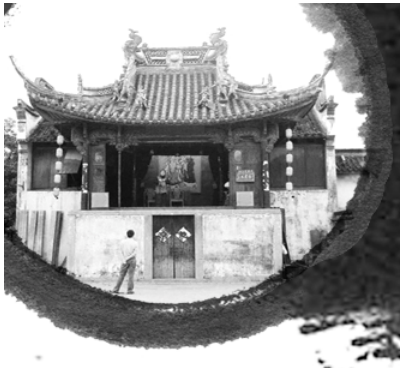
Tanglewood Music Shed, MA, USA



ACOUSTICS OF COURTYARD THEATRES

COMMENTS

- **Classic 3D-RT parameter does not suitable for a roofless space due to a quite non-diffused sound field existed**
- **Measured T30 in a roofless space should be denoted as 2.5D RT to avoid misleading**
- **Echogram in a roofless space shows significant difference with that in an enclosure due to lack of reflections from top surface, therefore affects the reverbrance**
- **Different opening area and its location affect the acoustics to a considerable extent**
- **Strength factor G(dB) and then C80 (dB) might be the more important parameters for a courtyard theater**

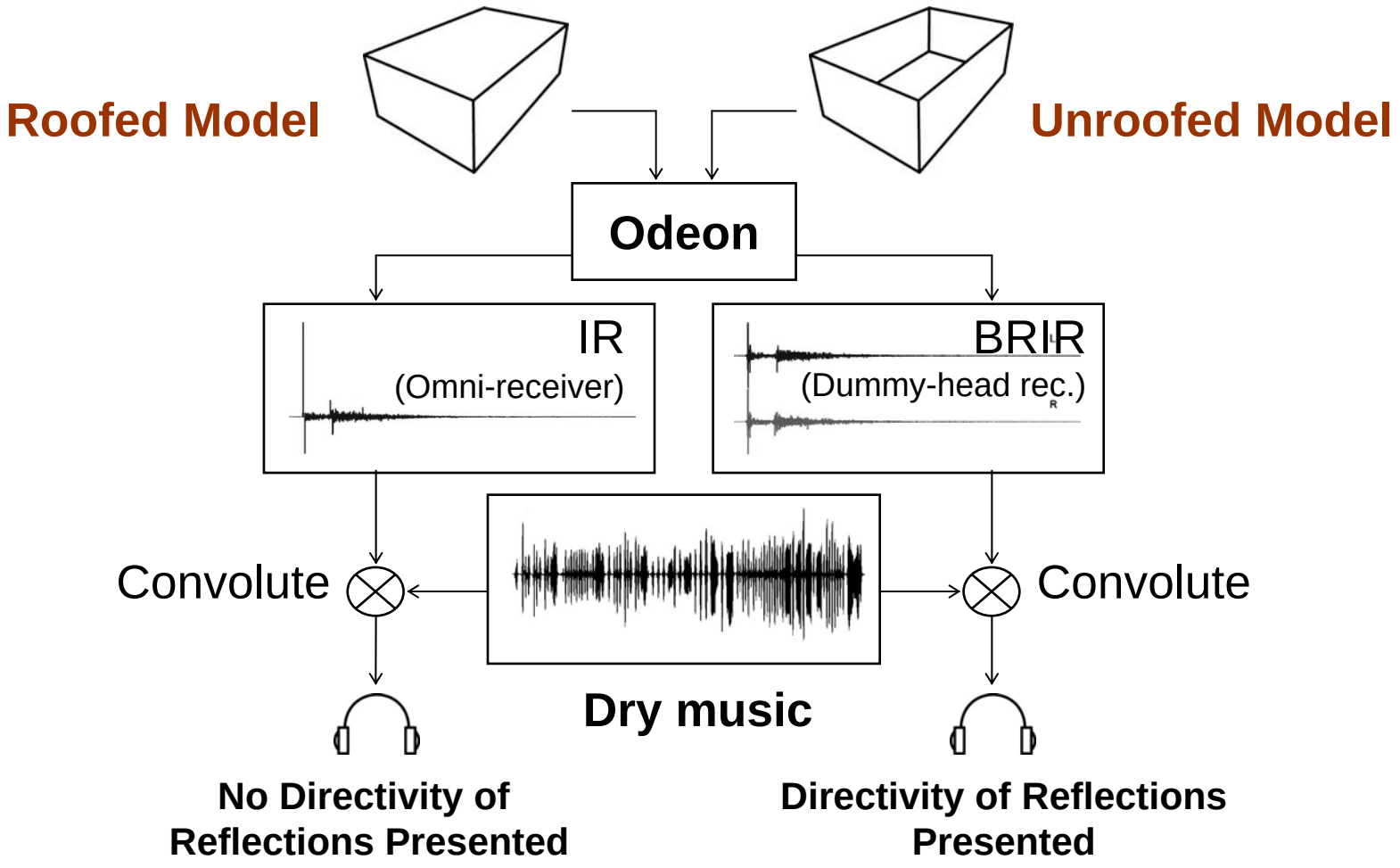


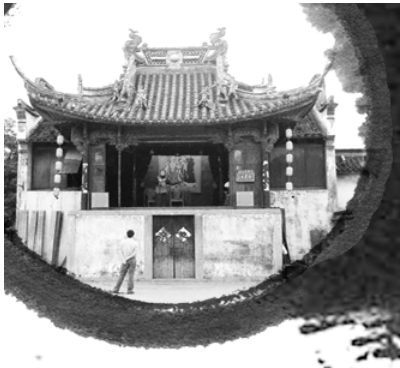
ACOUSTICS OF COURTYARD THEATRES

SUBJECTIVE TEST IS REQUIRED TO DISTINGUISH THE PERCEIVED REVERBERATION IN AN OPEN-TOP SPACE

COMPARISON TESTS FOR PERCEIVED REVERBERATION

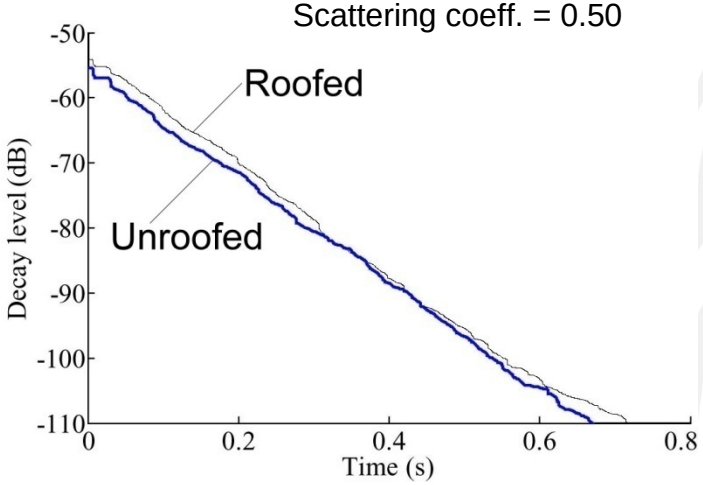
27 TEST SUBJECTS (14 Male, 13 Female)
DRY MUSIC SAMPLE: FLUTE, BACH, BADMENIE, 16 SEC PERIOD





COMPARISON TESTS FOR PERCEIVED REVERBERATION

Scattering coeff. = 0.50



Perceived as more reverberant

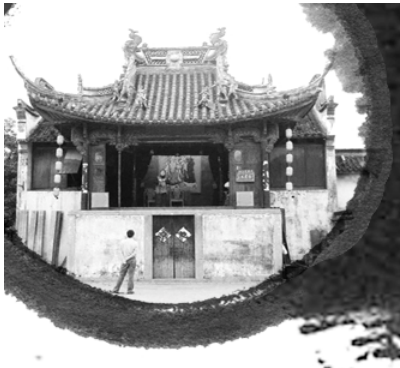
Unroofed Space
Roofed Space
No preference

CASE A

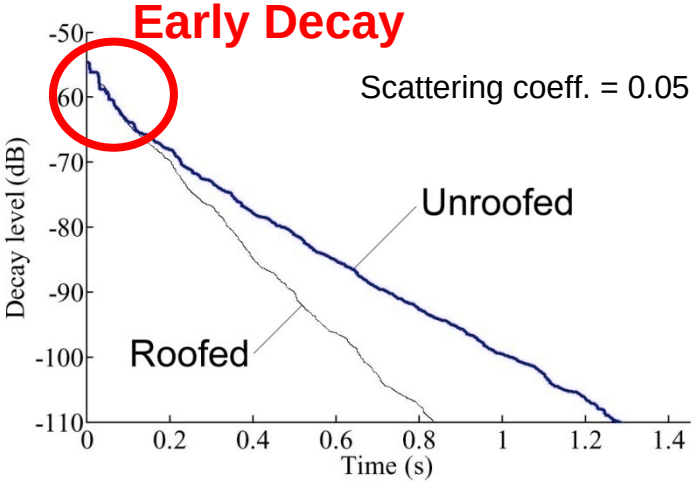
- **WHEN DIRECTIVITY OF THE REFLECTIONS IS ABSENT, PERCEIVED REVERBARTION IS ONLY DETERMINED BY THE DECAY RATE**

CASE B

- **PERCEIVED REVERBARTION IS STRONGLY AFFECTED BY THE DIRECTIVITY OF THE REFLECTIONS PRESENTED, EVEN AT THE SAME DECAY RATE**



COMPARISON TESTS FOR PERCEIVED REVERBERATION



Perceived as more reverberant

Unroofed Space
Roofed Space
No preference

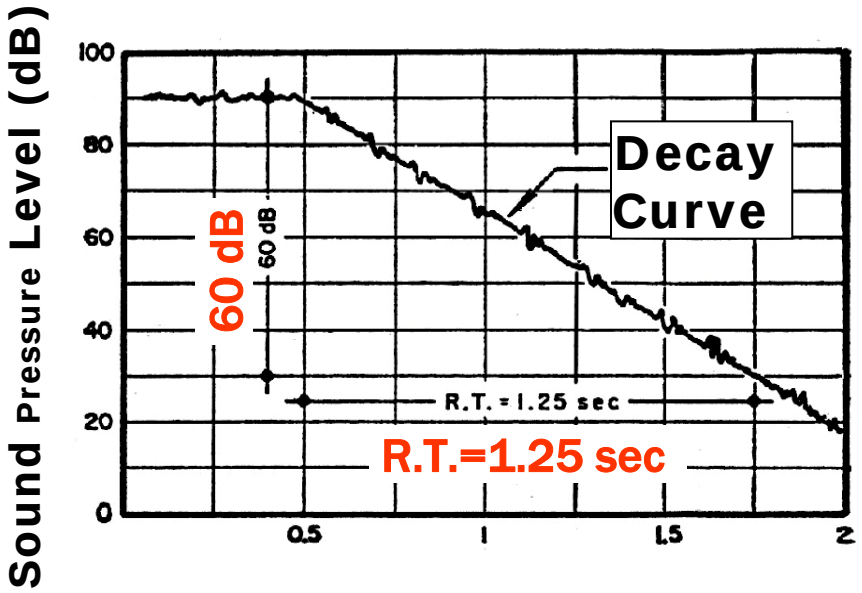
CASE A

- **EARLY DECAY IS IMPORTANT TO THE PERCEIVED REVERBERATION**
- **LATE DECAY MAY HAVE SOME INFLUENCE TO THE PERCEIVED REVERBERATiION**

CASE B

- **WHEN THE DIRECTIVITY OF RELECTIONS IS PRESENTED, PERCEIVED REVERBERATION MAINLY DETERMINED BY THE DECAY RATE**

Classic RT considered the decay rate only

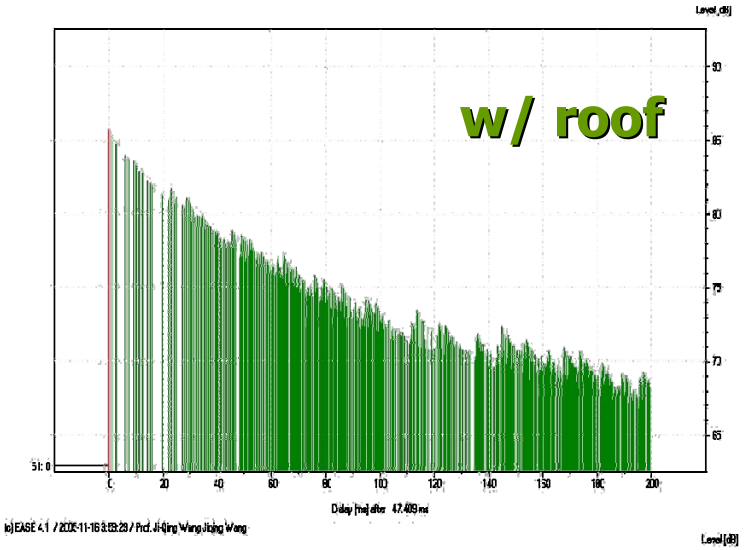


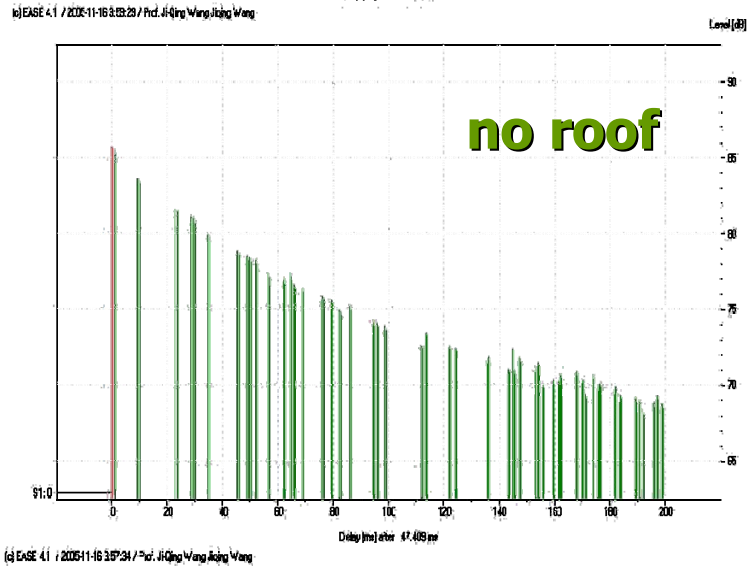
$$\text{Sabine Eq.: } T = \frac{0.16V}{A}$$

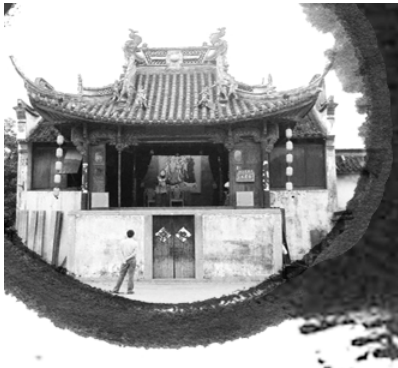
V - Volume (m^3)

A - Absorption (m^2)

Echograms only demonstrate the fine structure of the reflections vs time, nothing about their directivity



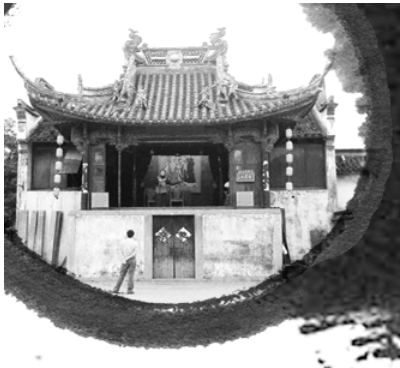




ACOUSTICS OF COURTYARD THEATRES

- The perceived reverbrance in an enclosed space mainly determined by the decay rate as the sound field is considerably diffused.

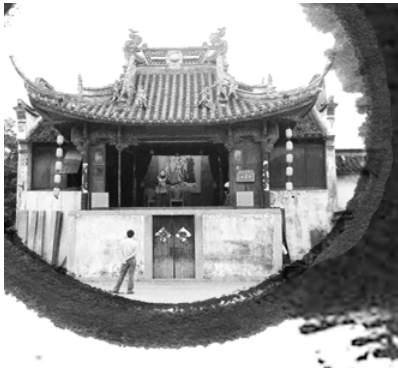
- To our experience, the perceived reverbrance in a roofless space might be also affected by the fine structure of the echogram and the directivity distribution of those reflections. The last effect was unknown before.



ACOUSTICS OF COURTYARD THEATRES

- **COURTYARD THEATRE IS A SPECIAL CASE IN ROOM ACOUSTICS, BUT RECEIVED LESS INVESTIGATION IN THE PAST**

- **MORE WORK IS NEEDED FOR FURTHER RESEARCH**



THANK YOU

FOR YOUR ATTENTION

ACKNOWLEDGEMENT

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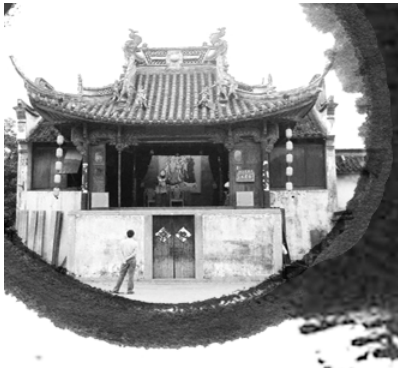

A SHORT VIDEO RECORDING SHOWING THE TRADITIONAL THEATRICAL THEATRE & OPERA PERFORMANCE AS FOLLOWING


越剧
《梁山伯与祝英台》选段
演唱 吴凤花 陈飞