Indian Bid to Host the ICM 2010

Presentation by the Indian Delegation

to

the General Assembly of the IMU, 2006

Santiago de Compostela, Spain

August 20, 2006

S. G. Dani, R. Hans-Gill, S. Kesavan and G. Misra

Large community of working mathematicians. Many leaders in their fields of research.

Several have been closely associated with the activities of the IMU.

Long tradition of mathematical research, spanning over three millenia.

State of the art facilities available for holding large meetings.

Marvelous tourist destination.

Ancient Indian Mathematics

- **Earliest explicit statement of what is called 'Pythagoras' theorem' goes back to the *Baudhayana Sulvasutra*, circa, 800 B.C.E.**

- **Various geometric principles were enunciated and constructions (of fire altars) based on them were described in the Sulvasutras (rules of mensuration).**

Pythagoras' theorem in the Baudhayana Sulvasutra

दीर्घचतुरस्रस्याक्ष्णयारज्जुः पार्श्वमानी तिर्यङ्मानी च
यत्पृथग्भूते कुरुतस्तदुभयं करोति ॥

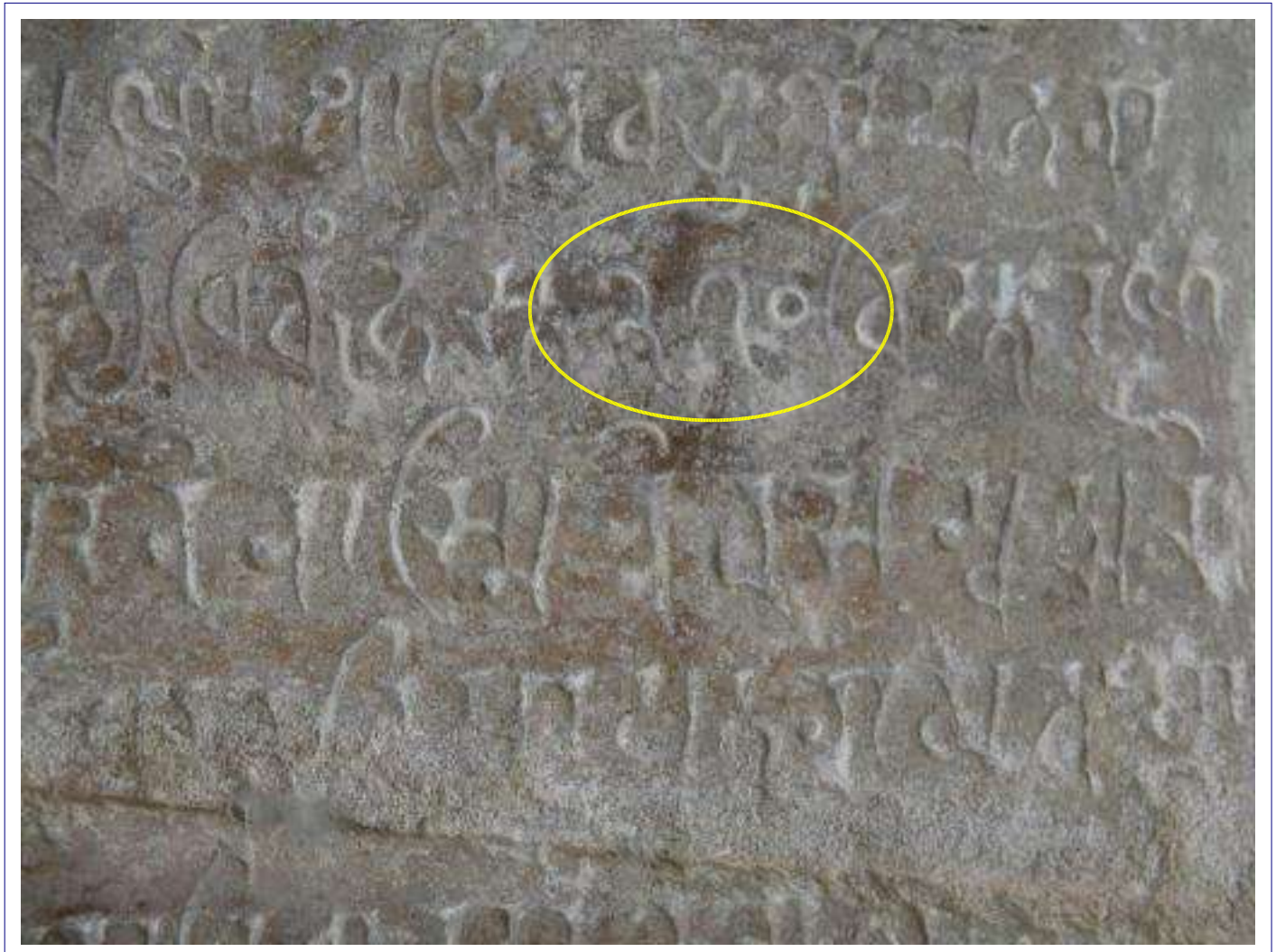
The diagonal of an oblong produces by itself both the areas which the two sides of the oblong produce separately (i.e., the square of the diagonal is equal to the sum of the squares of the two sides).

(Verse *48*, Chapter *1*)

- **Introduction of 'zero'.**

- **Decimal place-value system.**

- **A Ninth Century inscription in a temple in Gwalior with the number 270 appearing in it (as one side of a garden) bears testimony to the early writing of numbers in a way that is now common place.**



Courtesy: Bill Casselman

Aryabhata I (476 – 550)

- **Algorithm known as *Kuttaka* (pulveriser) for solving the indeterminate equation:**

$$by = ax + c$$

in integers.

- **Formulae for sums of progressions involving squares and cubes.**

- **Algorithms for finding square roots and cube roots (these crucially use the decimal place-value system for representing numbers).**

- **A value of π:**

चतुरधिकं शतमष्टगुणं द्वाषष्टिस्तथा सहस्राणाम् ।
अयुतद्वयविष्कम्भस्यासन्नो वृत्तपरिणाहः ॥

100 plus 4, multiplied by 8, and added to 62,000: this is approximately the measure of the circumference of a circle of diameter 20,000.

This gives:

$$\pi = \frac{circumference}{diameter} = \frac{62832}{20000} = 3.1416,$$

seen to be accurate to four decimal places.

Brahmagupta (598 – 665)

Well known for his identity for products of sums of squares:

$$(a^2 + b^2)(c^2 + d^2) = (ad - bc)^2 + (ac + bd)^2.$$

Formula for areas of cyclic quadrilaterals:

$$\text{Area} = \sqrt{(s-a)(s-b)(s-c)(s-d)}$$

a, b, c and d being the sides, and $s = (a + b + c + d)/2$ the semi-perimeter.

Sridhara (8th Century) –

- Formula for the solution of a general quadratic equation in one variable as we know it today.

Mahavira (9th Century)

- Simultaneous equations with linear and quadratic expressions.

- Empirical rules for computing the area and perimeter of an ellipse.

Jayadeva (9th century) and Bhaskara II (12th century)

- Are well known for their *Chakravala* (cyclic) method for solving indeterminate quadratic equations including what came to be known as 'Pell's equation'.

- Several topics in Arithmetic, Algebra, Geometry, Trigonometry, etc. saw a high point in the books of Bhaskara II.

Madhava of Sangamagrama (1340 – 1425)

Definitive progress made towards calculus.

- **Invented the Taylor series method.**
- **Rigorous mathematical analysis and**
- **Anticipated ('Gregory series') expansion for $\pi/4$.**

Nilakantha Somayaji (1444 – 1545) of the 'Madhava School' made considerable progress in mathematical analysis which anticipated the work of later western analysts, contributing to the rise of calculus.

The Modern Period (20th Century)

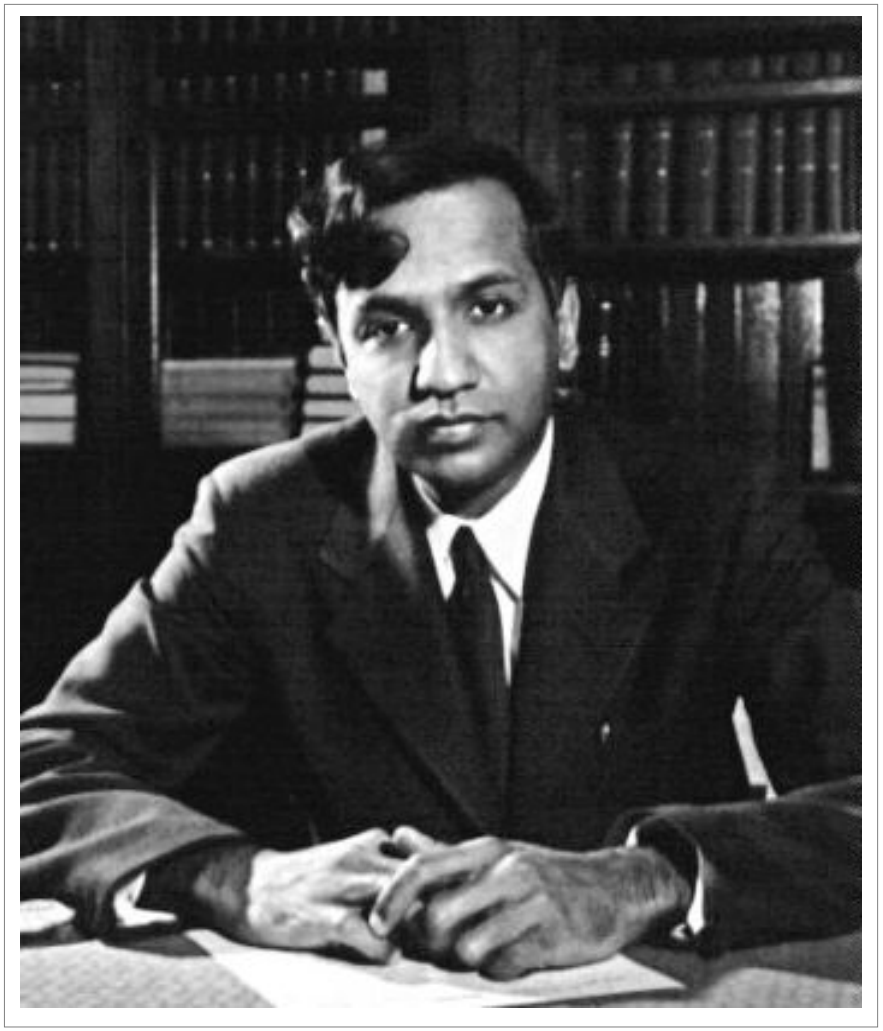
The Giants

Srinivasa Ramanujan

1887 - 1919

Harish-Chandra

1923 - 1983



S. Chandrasekhar

1910 - 1995

First Half of the 20th Century

Important mathematical developments took place in the following institutes:

- **Calcutta University**
- **University of Madras**
- **Allahabad University**
- **Banaras Hindu University**
- **Aligarh Muslim University**
- **Punjab University**
- **Indian Statistical Institute**
- **Indian Institute of Science**

Some important mathematicians

Ananda Rau (1893 – 1966)

R. Vaidyanthaswamy (1894 – 1960)

R. C. Bose (1901 – 1987)

S. S. Pillai (1901 – 1950)

T. Vijayaraghavan (1902 - 1955)

S. Chowla (1907 – 1995)

S. Minakshisundaram (1913 – 1968)

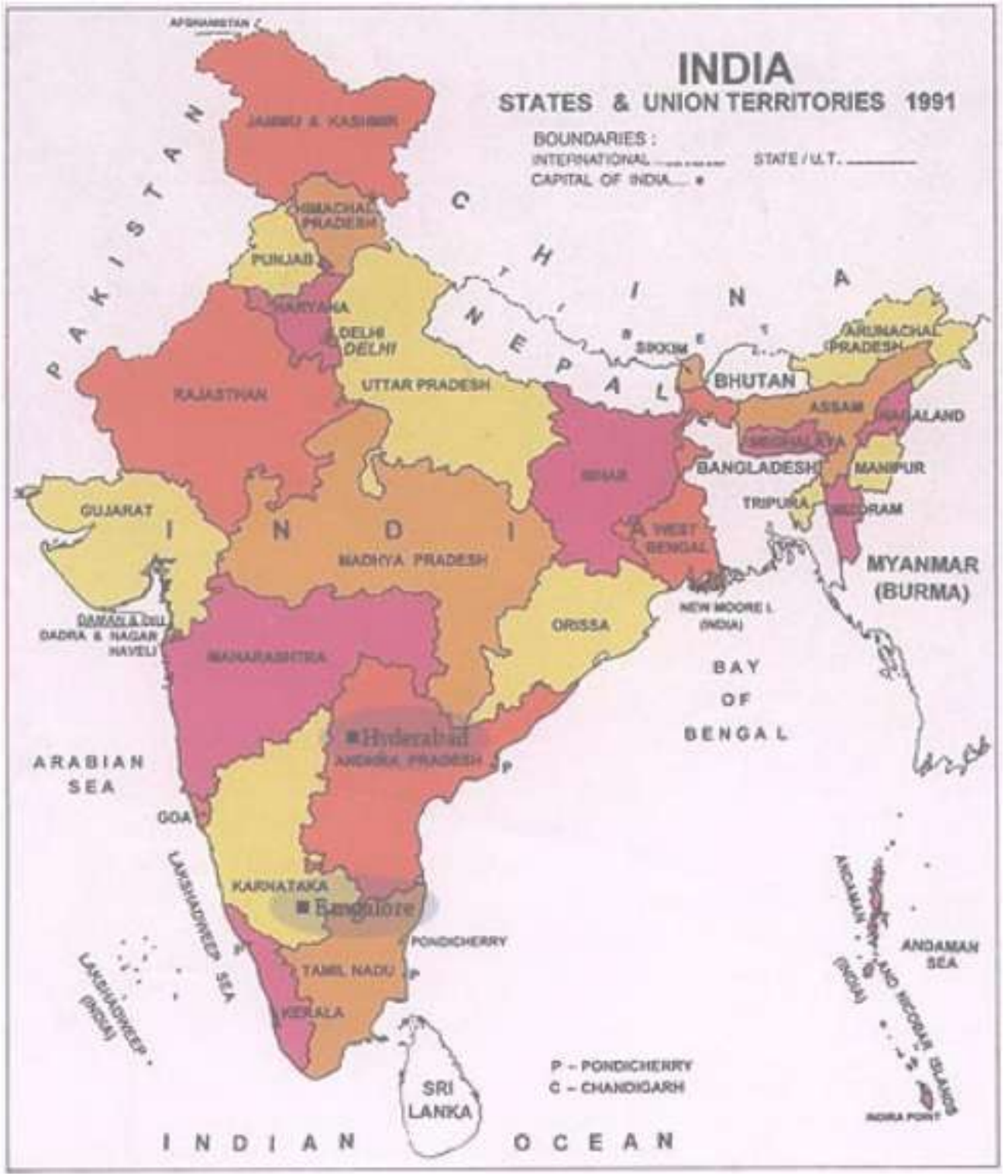
Latter half of the 20th Century

In the post independence era, several new institutions dedicated to research and teaching were set up. Notable among them are:

- **Harish Chandra Research Institute, Allahabad**
- **Indian Institutes of Technology (locations spread over the country).**
- **Institute of Mathematical Sciences, Chennai (Madras)**
- **Tata Institute of Fundamental Research, Mumbai (Bombay)**

Organizations

- Two national societies:
  - The Indian Mathematical Society
  - The Ramanujan Mathematical Society
- Several regional mathematical societies.
- The National Board for Higher Mathematics
- Three Academies of Science
  - The Indian National Science Academy (New Delhi)
  - The Indian Academy of Sciences (Bangalore)
  - The National Academy of Sciences, India (Allahabad)
- The Department of Science and Technology, Government of India


INDIA
STATES & UNION TERRITORIES 1991
BOUNDARIES :
INTERNATIONAL
STATE / U.T.
CAPITAL OF INDIA
AFGHANISTAN
PAKISTAN
CHINA
NEPAL
BHUTAN
BANGLADESH
MYANMAR (BURMA)
SRI LANKA
INDIAN OCEAN
ARABIAN SEA
BAY OF BENGAL
ANDAMAN SEA
JAMMU & KASHMIR
HIMACHAL PRADESH
PUNJAB
HARYANA
DELHI
RAJASTHAN
UTTAR PRADESH
SIKKIM
ARUNACHAL PRADESH
ASSAM
NAGALAND
MEGHALAYA
MANIPUR
TRIPURA
MIZORAM
BIHAR
WEST BENGAL
GUJARAT
MADHYA PRADESH
ORISSA
NEW MOORE I. (INDIA)
DAMAN & DIU
DADRA & NAGAR HAVELI
MAHARASHTRA
Hyderabad
ANDHRA PRADESH
GOA
KARNATAKA
Bangalore
PONDICHERRY
TAMIL NADU
KERALA
LAKSHADWEEP SEA
LAKSHADWEEP (INDIA)
ANDAMAN AND NICOBAR ISLANDS (INDIA)
INDIRA POINT
P – PONDICHERRY
C – CHANDIGARH

ICM, 2010

Dates: Thursday, August 19 to Friday, August 27, 2010

Venue: Hyderabad International Convention Centre, Hyderabad

- **Located in the center of India**
- **Historical City**
- **Home to the University of Hyderabad, the Osmania University and the Jawaharlal Nehru Technological University**
- **International Airport**
- **State of the art convention centre (proposed venue of ICM 2010).**
- **World class hotel accommodation**

General Assembly of the IMU, 2010

Dates: Monday, August 16 and Tuesday, August 17, 2010

Venue: Bangalore

- **Garden City of India**
- **Largest concentration of institutions devoted to research in science and engineering.**
- **Seat of the Indian Academy of Sciences**
- **International Airport**
- **Tourism: Hub for Mysore, Belur, Halebidu, Shravanabelagola, Hampi, ...**

प्रधान मंत्री
Prime Minister

New Delhi : August 2, 2006

Dear Prof. Ball,

I am delighted to learn that the Indian National Science Academy and other organizations in India have offered to host the International Congress of Mathematics, 2010 in India.

You are well aware of India's contribution to mathematics and of the outstanding work done by Indian mathematicians as well as mathematicians of Indian origin working in some of the most prestigious institutions of the world. Given India's important contribution to the discipline of mathematics as well as our more recent achievements in related fields, including computer sciences and information technology, I believe India deserves the honour and pleasure of hosting the International Congress of Mathematics.

I can assure you that the Government of India will wholeheartedly support the hosting of this event. I hope the Members of your Congress will enjoy their visit to India and benefit from the proceedings of the Congress in India.

[Manmohan Singh]

Professor John M. Ball
President, International Mathematics Union
Mathematical Institute
24-29, St Giles,
Oxford OX1 LB
United Kingdom

Rameshwar Thakur

RAJ BHAVAN
HYDERABAD-500 041

GOVERNOR
ANDHRA PRADESH

June 16, 2006

Dear Sir Ball,

I understand that India has made a bid to host the International Congress of Mathematicians (ICM) in 2010 and that Hyderabad is being considered as the venue. This ICM is a wonderful idea as it would give to mathematicians in India in general and Andhra Pradesh in particular an opportunity to interact with the best mathematicians from all over the World.

It would also give an opportunity to the three thousand or so delegates from abroad to savour the rich culture and traditions of the State of Andhra Pradesh. Hyderabad is a city which is now renowned all over the world for its cosmopolitanism and dynamic growth. It is a fine mixture of the old and new as would be evident to the delegates for themselves.

I hope the International Mathematical Union accepts India's bid and the Government of Andhra Pradesh will provide all support to make this conference a great success.

With best wishes,

Yours sincerely,

Rameshwar Thakur

(RAMESHWAR THAKUR)

Sir John Ball, FRS
Sedleian Professor of Natural Philosophy
Oxford University,
London
U.K.

Dr. Y.S. RAJASEKHARA REDDY

CHIEF MINISTER
ANDHRA PRADESH

HYDERABAD

Date:19-6-2006.

Dear Sir John Ball,

I understand that the International Mathematical Union (IMU) is shortly going to make a selection of the venue for the 2010 session of the International Congress of Mathematicians (ICM). I shall be extremely happy, if the prestigious event is awarded to India, particularly to Hyderabad, which is famed as a seat of Learning and eminent Research Institutions. It will be a matter of great honour for all of us in Andhra Pradesh, if the happening place of Hyderabad is selected as the host city for the ICM - 2010.

On behalf of the Government of Andhra Pradesh, I commit our wholehearted support to the bid of the National Board for Higher Mathematics (NBHM) for staging the event at Hyderabad, India in the year 2010.

With Regards

Yours sincerely,

(Y.S. RAJASEKHARA REDDY)

To
Sir John Ball, (FRS)
Sedleian Professor of Natural Philosophy,
Oxford University,
London, U.K.

A Ce nce t of Pa amer
Dr. Seyed E. Hasnain
FNA, FASc, FNASc, FTWAS
Vice-Chancellor
P.O. ral iversity Hyderabad - 500 046,
.21 Fax: +91-40-2301 1090
sil: .ernet.in www.uohyd.ernet.in

UH/VC/S-6

July , 2006

Dear Sir John,

It was a pleasure to have you with us at the University of Hyderabad and I do hope that your stay here was enjoyable and purposeful. I hope we managed to convince you that the infrastructural facilities available in Hyderabad are adequate for a Congress of the size and stature of the ICM in 2010 and that the State Government will extend full cooperation to the NBHM for hosting the Congress in Hyderabad. Let me assure you that the organizing committee of the Congress will have the full support of the University of Hyderabad and the University will spare no effort to ensure that the Congress is a success.

With best regards,

Sincerely yours,

Sayed

(Seyed E. Hasnain)

Sir John Ball, FRS
Sedleian Professor of Natural Philosophy
Oxford University
London, U.K.

sr/seh

Copy to:
✓ Professor R. Jandon

HYDERABAD
THE HINDU • THURSDA

Classifiedsmart: Page
Regional Advertisemen

AROUND THE CITY

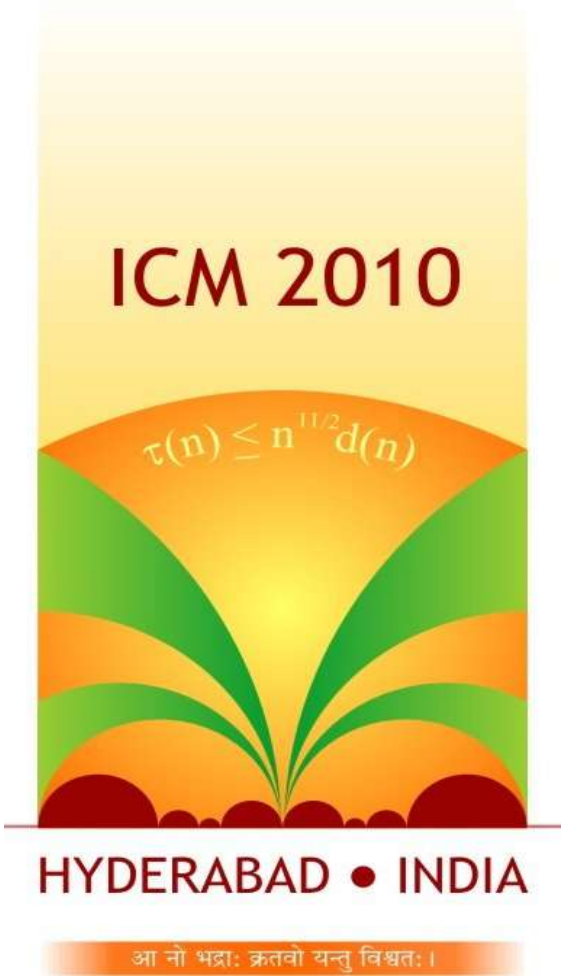
Bid for International Mathematics Congress

The Indian National Science Academy is bidding to host the 2010 International Congress of Mathematics (ICM) at Hyderabad International Convention Centre. Fields Medals, often called as 'Nobel Prizes' in Mathematics are awarded at ICM. This year the ICM is being held at Madrid, Spain. The International Mathematical Union (IMU) is an association of mathematical societies and academics of over 60 countries. Its purpose is to promote mathematical activities and encourage collaborative research. IMU holds the 9-day congress of the ICM 'Nobel Prizes' for every four years.

City to bid for maths congress

By OUR CORRESPONDENT

Hyderabad, June 21: Hyderabad is now making a bid to host the International Congress of Mathematicians (ICM) in 2010. The ICM will promote mathematical interaction among 4,000 delegates. Chief Minister Y.S. Rajasekhar Reddy has supported the bid made by a special committee of the Indian Science Academy to hold the ICM in India. He also supported the committee's bid to host the event in Hyderabad at the Hyderabad International Convention Centre. Sir John Ball, who is presiding over the International Mathematical Union met the Chief Minister on Wednesday. Dr Reddy welcomed the proposal and supported the bid and hoped that it would be accepted.



Rendez-Vous
Bangalore and Hyderabad
August, 2010
Welcome to India