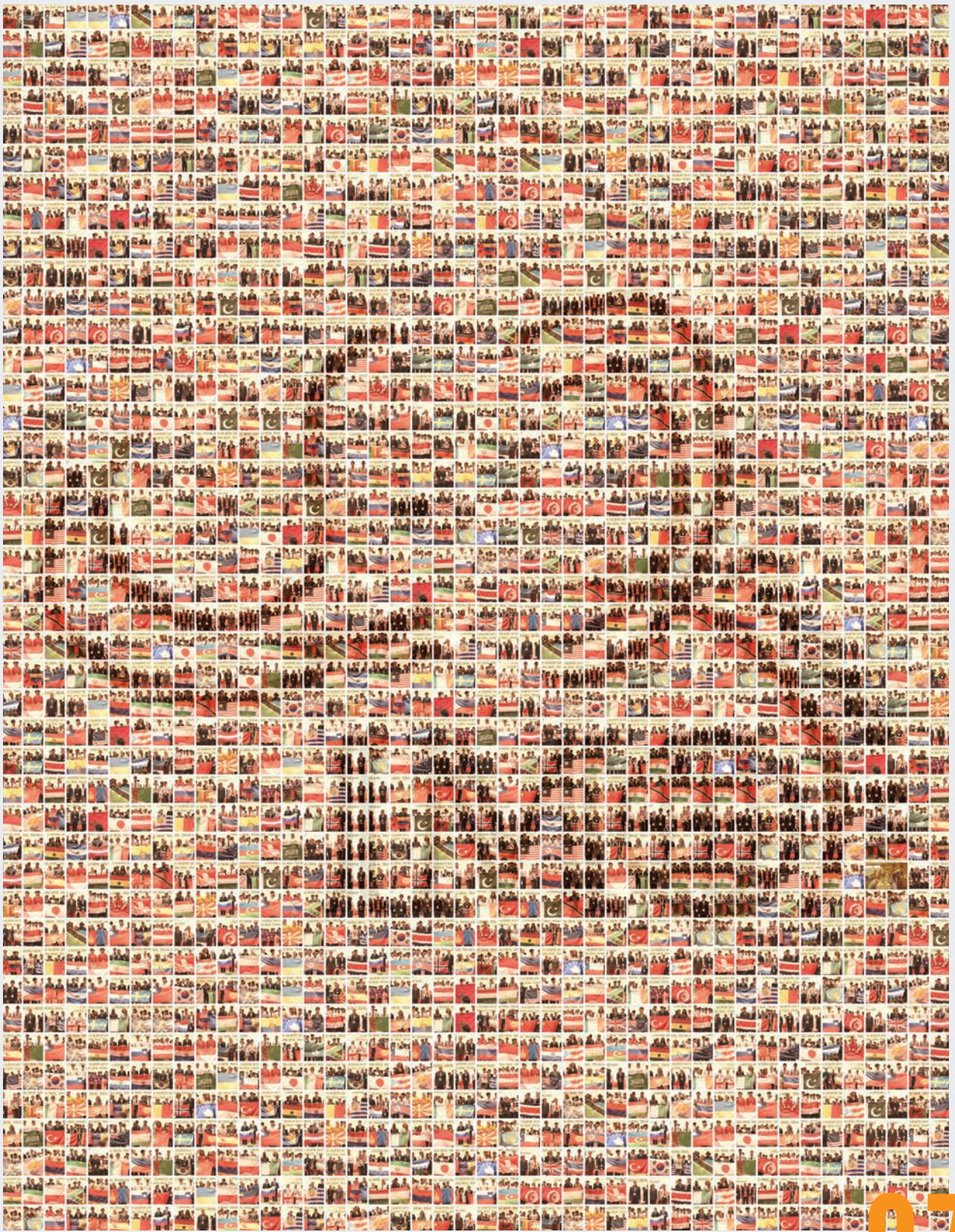
IMO POST 2015

THE 56TH INTERNATIONAL MATHEMATICAL OLYMPIAD
JULY 4-16, 2015 IN CHIANG MAI, THAILAND



DAILY NEWSLETTER JULY 15, 2015 ISSUE 07

IMO 2015 OFFICIAL RESULTS

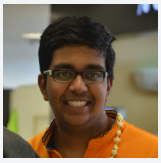
TOP 5 TEAMS

PERFECT SCORE AWARD

Zhuo Qun (Alex) Song
Canada

Australia


Alexander Gunning

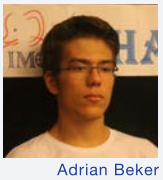

Seyoon Ragavan

Canada


Kevin Sun


Zhuo Qun (Alex) Song

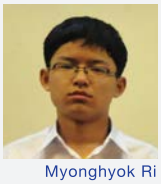
Croatia


Adrian Beker

PRK


Il Myong Ri


Kum Song Jon


Myonghyok Ri

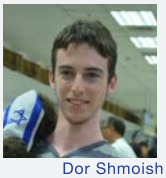
Islamic Republic of Iran


Ali Sayadi


Aria Halavati


Mojtaba Zareh Bidaki

Israel


Dor Shmoish

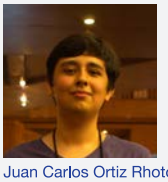
Italy


Francesco Sala

Kazakhstan


Akhan Ismailov

Mexico


Juan Carlos Ortiz Rhoton

China


Chenjie Yu


Jiafan He


Jiyang Gao


Nuozhou Wang

Peru


Christian Omar Altamirano Modesto


Raul Alfredo Alcántara Castillo

Poland


Adam Klukowski

Republic of Korea


Jaehyung Kim

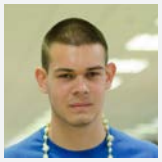

Jaewon Choi


Junghun Ju

Romania


Simona Diaconu

Serbia


Aleksa Konstantinov

Singapore


Sheldon Kieren Tan

Thailand


Suchan Vivatsethachai

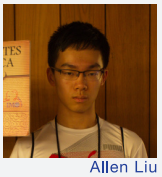

Wichaphon Akarasereenont

Ukraine


Denys Smirnov


Nataliia Khotiaintseva

United States of America


Allen Liu

David Stoner

Ryan Alweiss

Shyam Narayanan

Yang Liu

Vietnam

Thế Hoàn Nguyễn

Xuân Trung Vũ

Algeria
Yassine Hamdi

Armenia
Hakob Tamazyan

Australia
Ilia Kucherov
Jeremy Yip
Kevin Xian
Yang Song

Bangladesh
Md Sanzeed Anwar

Belgium
Pablo Bustillo Vazquez

Brazil
Daniel Lima Braga
Murilo Corato Zanarella
Pedro Henrique Sacramento de Oliveira

Bulgaria
Lyuben Lichev
Violeta Naydenova

Croatia
Daniel Paleka
Kristijan Štefanec
Petar Orlić

Cyprus
Andreas Stavrou

Democratic People's Republic of Korea
Jong Yol Ri
Song Hyok Kang
Songyong Choe

France
Adrien Lemercier
Florent Noisette
Vincent Bouis

Georgia
Zauri Meshveliani

Germany
Adrian Riekert
Christian Bernert

Greece
Petros Ntounis

Hong Kong
Hoi Wai Yu
John Michael Wu

Hungary
Barnabás Szabó
Kada Williams
Zsombor Fehér

India
Jeet Mohapatra

Indonesia
Adi Suryanata Herwana
Rezky Arizaputra

Islamic Republic of Iran
Amin Behjati
Farbod Ekbatani

Italy
Francesco Ballini
Nikita Deniskin

Japan
Ko Aoki
Yuki Saeki
Yuta Takaya

Kazakhstan
Olzhas Kadyrakunov

Macau
Hou Tin Chau

Mexico
Kevin William Beuchot Castellanos
Luis Xavier Ramos Tormo

Norway
Johan Sokrates Wind

People's Republic of China
Changzhi Xie
Zheng Wang

Peru
Jemisson Coronel Baldeón
Jimmy Espinoza Palacios

Philippines
Adrian Reginald Sy
Clyde Wesley Ang

Poland
Mikołaj Leonarski

Republic of Korea
Sehun Kim

Republic of Moldova
Cezar Port

Romania
Ciprian-Mircea Bonciocat
Marius-Ioan Bocanu
Ştefan Spătaru
Teodor Andrei Andronache

Russian Federation
Aleksandr Zimin
Alexander Kuznetsov
Ivan Bochkov
Ivan Frolov
Nikita Gladkov
Ruslan Salimov

Saudi Arabia
Alzubair Habibullah

Serbia
Anđela Šarković

Singapore
Dylan Shan Hong Toh
Kewei David Lin
Siah Yong Tan
Zhao Yu Ma

Slovakia
Eduard Batmendijn
Truc Lam Bui

Syria
Sami Rahmeh

Taiwan
Pang-Cheng Wu
Tai-Ning Liao
Tien-Chun Cheng
Yu-Pin Chiu

Tajikistan
Farrukh Karimov

Thailand
Pachara Savettamalya
Sivakorn Sanguanmoo
Thee Ngamsangrat

Trinidad and Tobago
Prasanna Ramakrishnan

Turkey
Ahmet Abdullah Keleş
Ahmet İleri
Feyza Duman
Halil İbrahim Güllük
Muhammet Furkan Merdan

Ukraine
Anastasiia Alokhina
Anton Trygub
Sofiia Dubova

United Kingdom
Harvey Yau
Joe Benton
Samuel Kittle
Warren Li

United States of America
Michael Kural

Vietnam
Anh Tài Hoàng
Hải Đăng Nguyễn Tuấn
Huy Hoàng Nguyễn

Algeria
Fayssal Saadi

Argentina
Lucas de Amorin

Armenia
Albert Gevorgyan
Arsen Hambardzumyan
Grigor Keropyan
Narek Khandanyan
Sergey Nersisyan

Austria
Bruno Perreaux
Josef Greilhuber
Levi Haunschmid

Azerbaijan
Hasanli Farid
Mahammad Shirinov

Bangladesh
Adib Hasan
Asif E Elahi
Md Sabbir Rahman
Sazid Akhter Turzo

Belarus
Aleksey Gaponenko
Dmitry Voynov
Yahor Dubovik

Bosnia and Herzegovina
Milica Đukić
Zlatko Salko Lagumdžija

Brazil
Gabriel Toneatti Vercelli
João César Campos Vargas
Rafael Filipe Dos Santos

Bulgaria
Aleksandar Cherganski

Canada
Alexander Whatley
Jinhao (Hunter) Xu
Michael Pang
Yan (Bill) Huang

Colombia
Daniel Cáceres
Juan Sebastian Díaz
Nicolás De La Hoz
Pablo González

Costa Rica
José Armando Chacón Rodríguez
Kevin Gabriel Coto Mora

Croatia
Ivan Lazarić

Cuba
Humberto Riverón Valdés

Czech Republic
Marian Poljak
Pavel Turek
Radovan Švarc

Denmark
Eigil Fjeldgren Rischel
Mads Bach Villadsen

Estonia
Joonas Kalda

France
Colin Davalo
Félix Breton
Julien Portier

Georgia
Aleksandre Saatashvili
Giorgi Khosroshvili
Giorgi Kldiashvili

Germany
Ferdinand Wagner
Jörn Stöhler
Sebastian Meyer

Greece
Christos Nestor Chachamis
Panagiotis Misiakos

Hong Kong
Man Yi Kwok
Shun Ming Samuel Lee
Wai Lam Cheung

Hungary
Barnabás Janzer
Márk Di Giovanni
Zsuzsanna Baran

India
Pranjal Warade
Shourya Pandey

Indonesia
Erlang Wiratama Surya
Henry Jayakusuma
Herbert Ilhan Tanujaya
Jonathan Mulyawan Woenardi

Islamic Republic of Iran
Ali Daeinaby

Israel
Dor Mezer
Liam Hanany

Japan
Hirotomo Shinoki
Kazuki Matoya
Takuya Inoue

Kazakhstan
Alen Abdrakhmanov
Alexandr Shakiyev

Liechtenstein
Robert Meier

Lithuania
Andrius Ovsianas

Macau
Cho Hou Tang
Hou Leong Sio

Malaysia
Ivan Chan Kai Chin
Tan Kin Aun
Yeoh Zi Song

Mexico
Antonio López Guzmán
Leonardo Ariel García Morán
Pablo Meré Hidalgo

Mongolia
Bodrol Olonbaatar
Erdenebayar Bayarmagnai

Montenegro
Nikola Raicevic

Netherlands
Bob Zwetsloot
Eva van Ammers
Yuhui Cheng

New Zealand
Miles Yee-Cheng Lee
Xuzhi Zhang

Pakistan
Awais Muhammad Chishti

Paraguay
Elvis Alexander Agüero Vera
Gerardo Sigfredo Fisch Paredes
Roberto Daniel Filizzola Ortiz

Peru
Henry Felén Chávez

Philippines
Albert John Patupat
Farrell Eldrian Wu

Poland
Konrad Jan Paluszek
Mariusz Trela
Paweł Piwek
Piotr Pawlak

Portugal
Francisco Tuna de Andrade
Henrique Rui Neves Aguiar
Nuno Miguel Arala Santos

Puerto Rico
Francisco Proskauer Valerio

Republic of Korea
Chaewon Kim
Youseong Lee

Republic of Moldova
Dionisie Nipomici
Vladimir Cucu

Romania
Andrei-Bogdan Puiu

Saudi Arabia
Omar Alrabiah
Salman Saleh
Shaden Alshammari

Serbia
Ivan Damnjanović
Ognjen Tošić

Singapore
Yijia Liu

Slovakia
Patrik Bak
Samuel Sládek
Zhen Ning David Liu
David Popović

South Africa
Yaseen Mowzer

Spain
Ismael Sierra

Sweden
Malte Larsson
Tianfang Zhang

Switzerland
Daniel Peter Rutschmann
Henning Zhang
Horace Chaix

Syria
Muhammad Hanino

Taiwan
Calvin Shao-Huai Hsu

Tajikistan
Kalomidin Klychev

Thailand
Thatchanok Khampitak

The former Yugoslav Republic of Macedonia
Bozhidar Stevanoski

Tunisia
Zouhaier Ferchiou

Turkmenistan
Alshir Soyunjov
Dovlet Ovlyagulyyev

Ukraine
Dinh Thanh Phong Vo

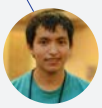
United Kingdom
Neel Nanda

Uzbekistan
Abbos Muhammedov
Jamshid Yakshiev
Sardor Bazarbaev

Vietnam
Việt Hà Nguyễn Thị

It's great experience that I'll never forget. Thailand is very far from my home.
"**I**deal **M**inion **O**x"

- Christian Omar Altamirano Modesto - Peru

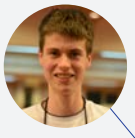


I get to see excursion, Thailand and temples.
"**I**ntriguing **M**esmerizing **O**rganization"

- Princewill Chukwuemeka Okoroafor - Nigeria

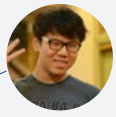
I've got some friends here.
"**I**ce-cream **M**oney **O**range"

- S M Nayeemul Islam - Bangladesh



I like the way it was organized. I like food a lot.
"**I**t's **M**agic **O**rigin"

- Oisín Flynn-Connolly - Ireland



I like mathematics especially geometry.
"**I** think **M**ost delicious fruits is **O**range"

- Jaewon Choi - Republic of Korea

Impression: This is a very interesting country. The competition brings math lover and friendship among different country to us. I really like Thai culture and beautiful attractions such as, tigers, temples and elephants. One day I will come here again.
"**I**ncreible **M**entes **O**perando"

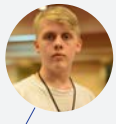
- Costa Rica -

I like food and elephant.
"**I**ntil **M**aqsad Uchun **O**mad Sari"

- Khurshid Juraev / Abbos Muhammedov - Uzbekistan

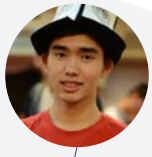
Well-organized competition.
"**I**nsufficient **M**anageable **O**pportunity"

- Emil Skovgaard - Denmark



My first time but quite fun. Enjoy math a lot.
"**I**nternal **M**echanical **O**bstruction"

- Atli Fannar Franklín - Iceland



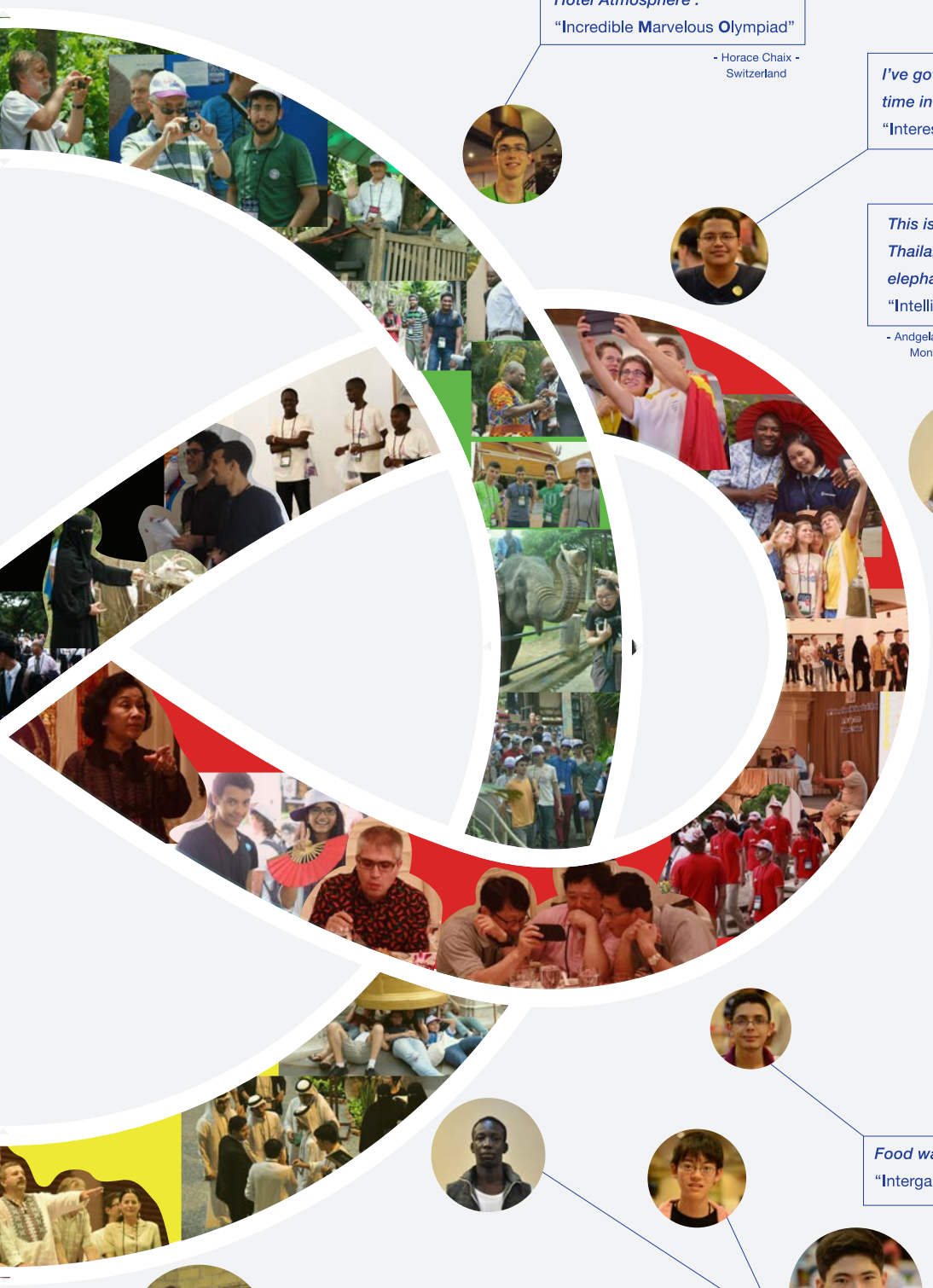
Food,Temple,People,Guides.
"**I**ce-cream **M**ango **O**rchid"

- Arstan Ashyrbekov - Kyrgyzstan

Nothing to complain.
"**I**ce **M**emory **O**bstacle"

- Ilia Kucherov - Australia

WHAT IS IMO?



Hotel Atmosphere .
"**I**ncredible **M**arvelous **O**lympiad"

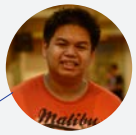
- Horace Chaix -
Switzerland

I've got a good experience in my first time in IMO. Trips are great.
"**I**nteresting **M**ath **O**range"

- Dennis Joaquin Diaz Diaz -
El Salvador

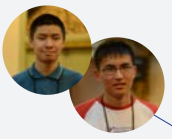
This is my first time in IMO competition and Thailand. I love Thailand so much especially elephant camp show.
"**I**ntelligent **M**ontenegro **O**svajanje"

- Andgela Mereovic -
Montenegro



Good representation of Chiang Mai.
"**I**magine **M**agic **O**MG!"

- Sivakorn Sanguanmoo -
Thailand



Food!
"**I**rreversible **M**uscle **O**bstruction"
"**I**ntelligent **M**afia **O**perating"

- Eduard Batmendijn / Truc Lam Bui -
Slovakia

Food was ready everywhere we went.
"**I**ntergalactic **M**ango **O**rganization"

- Anass El Idrissi -
Morocco

Excited, truly international.
"**I**deas **M**ath **O**lympiad"

- Olzhas Kadyrakunov -
Kyrgyzstan

Impression: It is a nice and challenge contest. I actually like elephants during the trip so much.
"**I** **M**oved **O**n"

- Fabian Chibuike Okafor -
Nigeria

Well-organized competition / Great elephant camp trip.
"**I**nternational **M**indful **O**bjective"

- Andrej Ivanov / Bozidar Stevanoniki -
The former Yugosla Republic

I love umbrella making and taking picture.
"**I**nteresting **M**assage **O**ops!"

- Takuya Inoue -
Japan

ANNOUCEMENT

Ehlen ve sehlen Ya habibi!

IRAQ is a middle east country. It's fomous all over the world for oil sources and historical castles. This the first time IRAQ has participated to International Mathematical Olympiad and Yusuf Zeybek, Yunus Kocataş are IRAQ's observers.

It's a great honour to be a part of this competition and we hope next year we will compete in Hong Kong. International olympiads is an effected activity to improve our math and science education.

We specially thank to Thailand for hosting this year's IMO2015 and for assistance and hospitality provided at all stages. Special thanks to the IMO Advisory Board for inviting IRAQ.




Big thanks to all members of the IMO 2015 liaison team for bringing enthusiasm, resourcefulness and an intrepid can-do attitude to your job of taking care of the contestants and showing them the best of Thai hospitality. Your hard work and patience helped make IMO 2015 a big success. **Good job, everyone!**

HONG KONG

WILL HAVE THE PRIDE OF HOSTING THE BRIGHTEST HIGH SCHOOL MATHS TALENTS FROM AROUND THE WORLD AT THE 57TH INTERNATIONAL MATHEMATICAL OLYMPIAD (IMO) IN JULY 2016!

A cosmopolitan city strategically located at the heart of Asia, Hong Kong is home to a diverse community that embraces excellence and quality living. Creativity and entrepreneurship converge in this free and dynamic place is superbly connected to the rest of the world.

IMO 2016 will be organised by the IMO Hong Kong Committee. The Hong Kong University of Science and Technology will be the Host University and the Education Bureau of the Government of the Hong Kong Special Administrative Region will be a Supporting Organisation.

Hong Kong has been taking part in the IMO every year since 1988 and had the privilege of hosting 69 delegations at the 35th IMO in 1994. Having continued to thrive in the "One Country, Two Systems" structure after our transfer of sovereignty to the People's Republic of China in 1997, we look forward to welcoming the IMO community again in 2016!

Don't hesitate to find out more about Hong Kong and IMO 2016 from the IMO 2016 materials you received during IMO 2015!

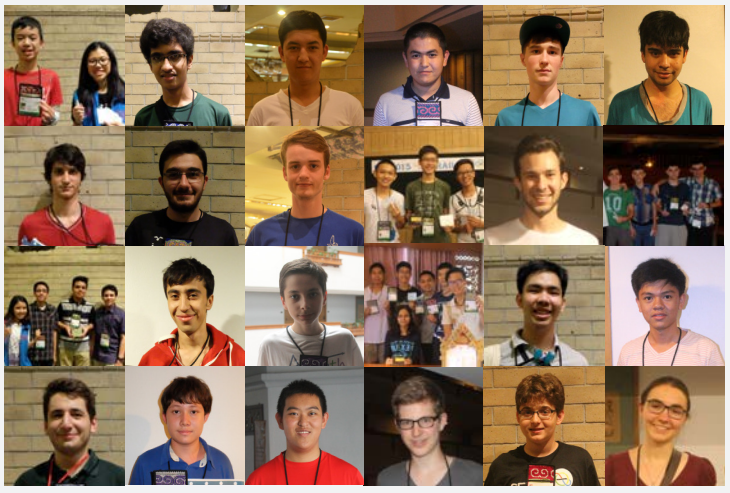

Image from: https://upload.wikimedia.org/wikipedia/commons/0/0e/Hong_Kong_Island_Skyline_2009.jpg
http://asia.vacationxtravel.com/victoria-peak-tower-famous-landmark-hong-kong

Friendship Award!!

Halil Ibrahim from Turkey

MATH IS FUN FINAL AWARDS

Malaysia team
Perman Iljanov
Paulius Asvydis
félix breton
Yang Song
Robert Sparkes
Sardor Bazarbaev
Sazid Akhter Turzo
Francisco proskauer
Muhammet furkan merdan
Ahmet Abdullah Keles
Nicolás Vilches
Jafet Alejandro Baca Obando
Mengsay Loem
Gabriel Emiliano Carranza
Menjívar
Geogia Team
Yakhshiev Jamshid
pitchayut wongrachit



HOW AN ANCIENT CALENDAR IS ADJUSTED

The system of dividing time into convenient periods of days, months, and years is called the calendar. The earliest calendars were based on the lunar cycles, but most lunar calendars have now been adjusted to coincide with the solar year.

LUNAR YEAR AND SOLAR YEAR

A lunar month is the time between two full moons and its length is 29.530588 days. A lunar year consists of 12 lunar months and its length is 354.367056 days.

To understand what the solar year is, one first needs to know about the equinoxes. An equinox is the time when the sun crosses the equator making the lengths of day and night equal in all parts of the earth. An equinox takes place twice a year, once in the spring (Spring or Vernal Equinox) and once in the fall (Fall or Autumnal Equinox). The solar year is the length of time between two Spring equinoxes, which is 365.242199 days.

In addition to the lunar and solar years, there is also the star year. Also called the sidereal year, this refers to the length of time the Earth takes to make a complete orbit around the sun in reference to a fixed star. A star year is 365.25636 days long.
The difference between the solar and the lunar year is 10.875143 days while the difference between the star year and the solar year is only 0.014161 days.

HINDU-CHINESE LUNAR YEAR

On Hindu-Chinese lunar calendars, the new moon is the first day of the month. The waxing moon covers the first half of the month, the waning moon the second half. The full moon occurs on the last day of the first half, the dark moon on the last day of the second half. The months in which the dark moon occurs before midnight on the 29th day have 29 days while the rest have 30 days each. In Hindu-Chinese leap years, the dark moon occurs twice while the sun is in the same zodiac sign. Such years contain 13 months while all other years contain 12 months. These events form the “19-Year Cycle” with leap years falling on the 3rd, 6th, 9th, 11th, 14th, 17th and 19th years.

SUVARNABHUMI CALENDAR

The Suvarnabhumi calendar is used for farming and religious purposes in the parts of South-East Asia formerly known as Suvarnabhumi (including Cambodia, Laos, Myanmar, Thailand and Xishuangbanna in China’s Yunnan province).

The calendar is based on the lunar cycles and needs to be adjusted periodically to coincide with the solar year. In the 19-year cycle, there are 7 leap years of 13 months each. The 1st, 3rd, 5th, 7th, 9th, and 11th months of the year have 29 days each, whereas the other 6 months all have 30 days. The average length of a month in this calendar is 29.5 days, or 0.030588 days shorter than the true lunar month. This is why most of the dark and full moons on the Suvarnabhumi calendar occur before the real dark and full moons in the sky (and also before the dark and full moons on the Hindu and Chinese calendars).

Like the Hindu and Chinese calendars, the Suvarnabhumi calendar has the waxing moon in the first half of the month and the waning moon in the second half. But unlike the Hindu and Chinese calendars, it needs to be adjusted to align not only with the solar year but with the lunar month as well. The latter adjustment is done to make each month fall during the same season throughout the region, with the first month ending in mid-winter, the waning moon of the 3rd month occurring at the end of winter, the waning moon of the 5th month taking place in mid-summer, the waning moon of the 6th month occurring at the start of the rainy season, the waning moon of the 8th month occurring at the start of heavy rains, and the waning moon of the 12th month taking place at the start of winter.

The above conditions can only be fulfilled if all of the following are true:
(i) The dark moon of the 1st month is the first dark moon after the South Solstice.
(ii) The dark moon of the 4th month is the first dark moon after the Vernal Equinox.
(iii) The full moon of the 8th month is the first full moon after the North Solstice and its appearance takes place at least 11 days after the North Solstice.

VIHARAS AS ADJUSTING INSTRUMENTS

In parts of Suvarnabhumi, the viharas (shrine halls) at some Buddhist temples were built to serve as adjusting instruments for the Suvarnabhumi calendar. Two of the most outstanding examples are the vihara of Wat Phra Yuen in Lamphun Province, south of Chiang Mai, and the vihara of Wat Xieng Thong in Luang Prabang, Laos.

The planar projection diagram of the sun’s rays shining into the Vihara of Wat Pra Yuen is given in Figure 1 and can be compared with that for the Vihara of Wat Xieng Thong.

The following are warning signs that in some years the conditions (i)-(iii) will be contradicted:
(1) The full moon of the 12th month occurs before the sun’s rays are at 17.625 °S after the Autumnal Equinox (before November 10, see Figure 1). This will make the dark moon of the following month fall on or before the South Solstice, and the full moon of the 3rd month occur before the start of the summer.
(2) The dark moon of the 4th month occurs on or before the Vernal Equinox. This will lead to the full moon of the 6th month occurring before the start of the rainy season.
(3) The full moon of the 8th month occurs on or before Day 11 after the North Solstice (before the heavy rains start).
(1)-(3) are conditions in which (1) implies (2), (2) implies (3), and (3) requires the addition of a second 8th month to make the full moon of the coming 12th months obey the rule and also make the conditions (i)-(iii) given above come true.

All of these conditions depend on whether or not the full and dark moon days of the Suvarnabhumi calendar coincide exactly with the full and dark moons in the sky. This is the origin of the tradition of moon worship in the 3rd, 5th, 6th, 8th and 12th months, which involves checking whether or not the full moon is truly so.

The criteria for checking the full and the dark moons in Suvarnabhumi are as follows:
(a) The really full moon must be a complete circle.
(b) At sunset, the moon’s angle of elevation must not exceed one-eighth of the sky (22½°).
(c) The complete full moon must occur on the last day of the waxing moon.
(d) The day after the complete full moon, the moon is no longer a complete circle and appears in the sky after sunset.
(e) A true dark moon is ascertained when a complete absence of moon is observed after midnight on the eve of the dark-moon day, or before midnight on the dark-moon day.

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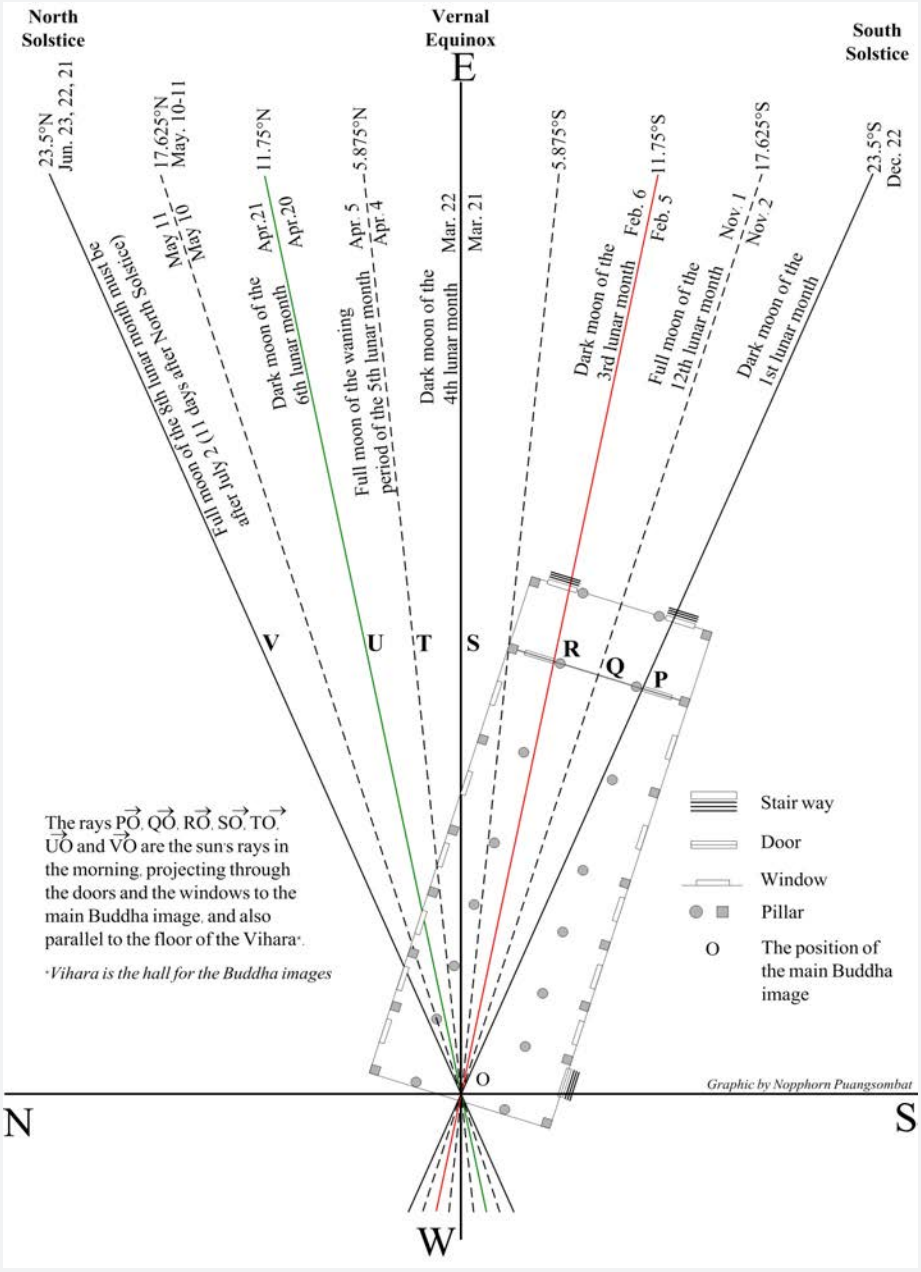

Figure 1 A planar projection diagram showing sun rays coming into the vihara of Wat Pra Yeun, Lamphun, Thailand, before the 2006 renovation (which added a middle door at Q and also reduced the number of stairways facing the middle door to only one).

Of these criteria, only (b) and (d) are specific to Suvarnabhumi.

Following these checks, if it is clear that the full or dark moons on the calendar are out of sync with reality, then the 7th month needs to be extended to 30 days. This, in turn, will make the full moon of the 8th month a true full moon.

As mentioned above, the viharas of Lumphun's Wat Phra Yuen (built in AD 666) and Luang Prabang's Wat Xieng Thong (built in AD 1560) were built to serve as adjusting instruments for the Suvarnabhumi calendar. The alignments of the buildings themselves as well as their doors, windows and the locations of their principal Buddha images are designed in such a way that the sun rays coming through a certain opening and hitting the Buddha image at a certain time of the year can help you figure out whether the calendar needs to be adjusted.

Let's imagine that we are in the vihara of Wat Phra Yuen one morning in the 1st month on the Suvarnabhumi calendar. We observe that the sun rays shining through P (see Figure 1) and parallel to the floor hit the Buddha image (O). If today is the dark-moon day of the 1st month, all is fine. But if today is the dark-moon day of the 12th month, then a second 8th month needs to be added to next year's calendar.

If you visit Wat Phra Yuen or Wat Xieng Thong, try this trick and find out whether this ancient adjusting instrument really works.

(This article is adapted from *"The Existing Suvannaphum at Wat Phra Yuen"*, Chiang Mai Journal of Science, 2007; 34(2): 143-149 by the late Assoc. Prof. Smai Yodindra, a long-time faculty member at Chiang Mai University's Department of Mathematics.)

(Note: Suvannaphum is an alternative spelling of Suvarnabhumi.)

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