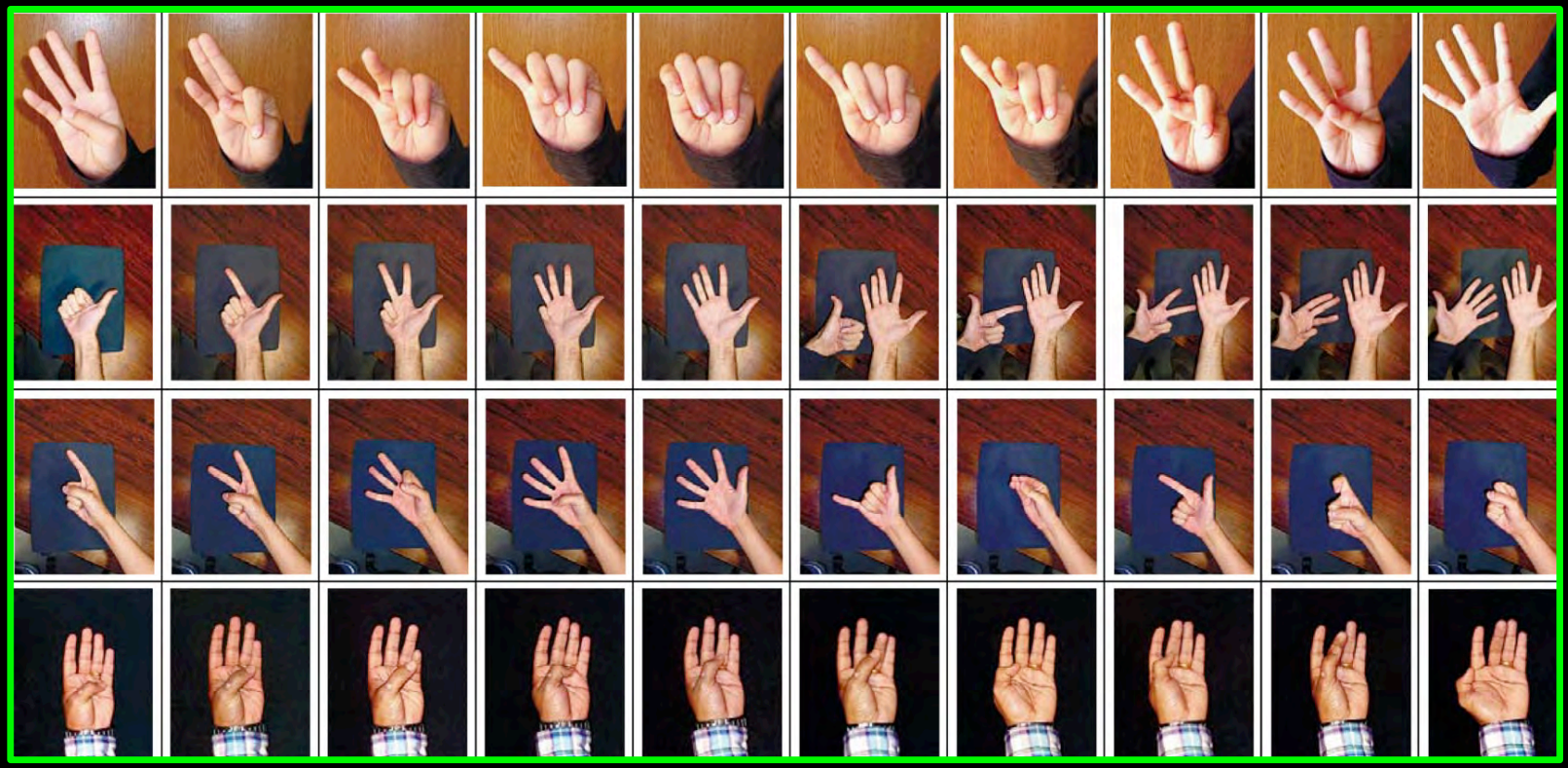
Different Cultures, Same Science



Yasushi Suto

Department of Physics, The University of Tokyo
Global Scholar, Department of Astrophysical Sciences, Princeton University

16:30- October 23, 2013 @202 Jones Hall

Peyton(=Princeton) and me

- 1988 : started to work with Jerry Ostriker in cosmology
- 1991: Jerry and Ed Turner encouraged several Japanese to join a cosmological survey project, SDSS, which turned out to be the first big international collaboration in Japanese optical astronomy

SDSS

- 2001: started to work with Ed on exoplanets
- 2006: Ed and I discussed a possibility of collaboration between Princeton and Subaru telescope, which led to the NAOJ-Princeton collaboration on Subaru telescope

SEEDS
HSC

- 2009-10, 2013: Global scholar, Princeton University

International Research Network for Dark Energy (JSPS, core-to-core program 2007-2012)

DENET

Princeton U. Dept. of Astrophys. Sci.
coordinator
Edwin Turner

CMB
Gravitational lens
Baryon oscillation

Univ. of Tokyo Res. Center for the Early Universe
coordinator
Yasushi Suto

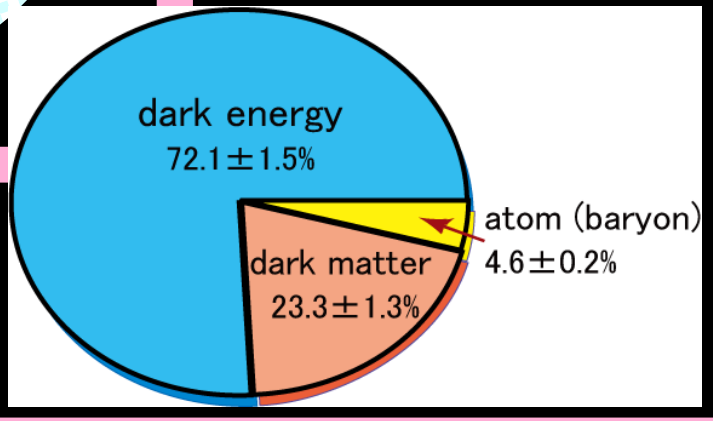
Tohoku Univ.
NAOJ
Hiroshima Univ.
Kyoto Univ.
Nagoya Univ.

Institut d'Astrophysique de Paris
coordinator
Jerome Martin

Modified gravity
Extra-dimension
backreaction

Edinburgh U. Royal Obs.
coordinator
John Peacock

Theoretical model
Baryon oscillation
Weak lens mapping



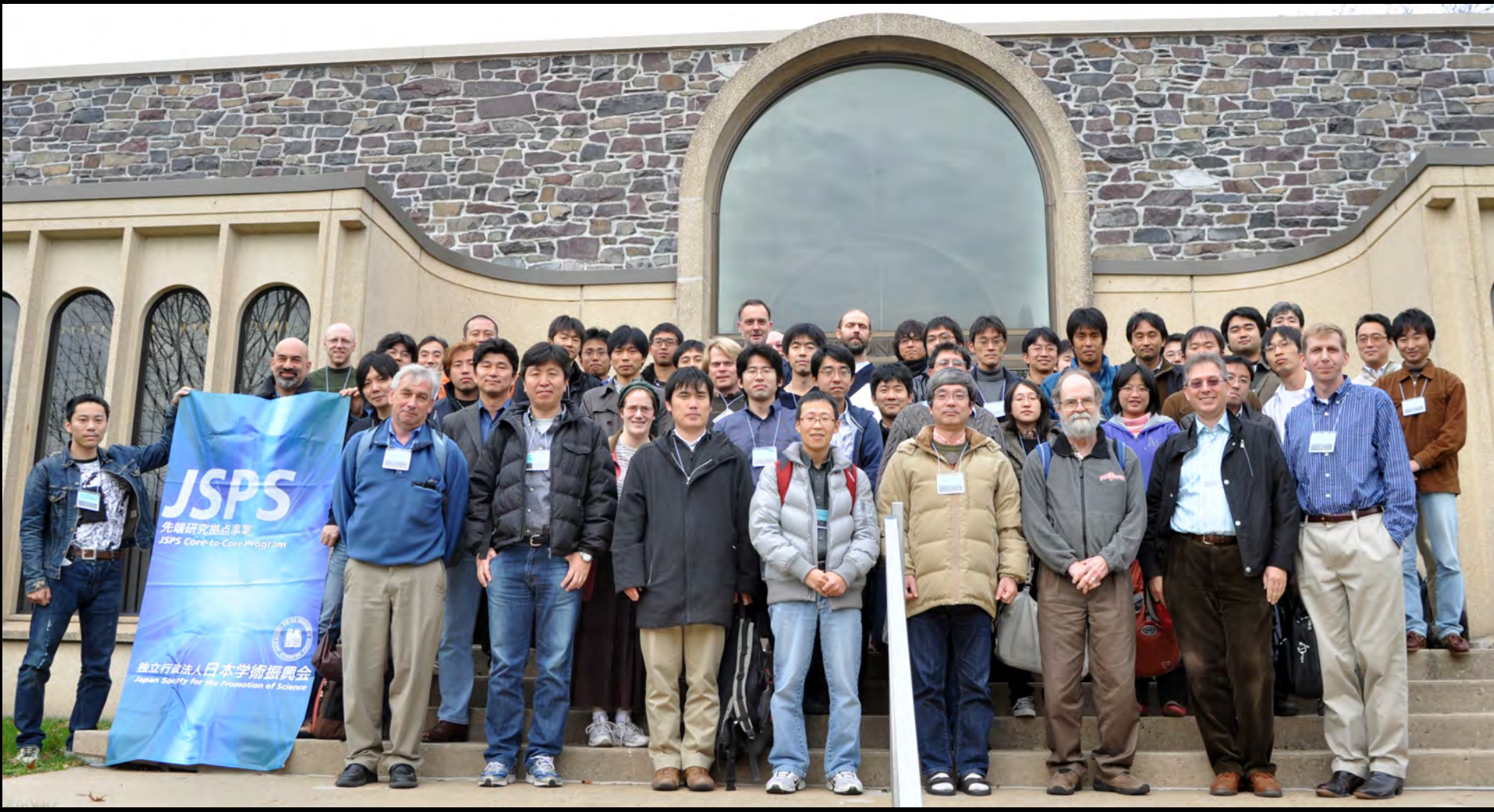
JSPS-Princeton workshop
"Cosmology with wide-field imaging surveys of galaxies"
June 6-7, 2006@University of Tokyo

Discussion on NAOJ-Princeton collaboration over *Shabu-shabu*
December 19, 2006@Kisoji

Princeton-JSPS meeting

"*Science Opportunities with Wide-Field Imaging and Spectroscopy of the Distant Universe*"

Nov. 9-12, 2009@Peyton, Princeton University



Neither culture is better nor worse, just different

1) Should we hold rice bowls in our hands ?

- Japan: Yes. We are supposed to do so.
- Korea: No. Absolutely you shouldn’t.

How to hold rice bowls: two different interpretations

- Japan: Humans should use their hands, so as to emphasize that they are not animals ! (Animals cannot use hands)
- Korea: To hold rice bowls in front of others looks like begging, which you should avoid.

Neither is better nor worse; we should respect the difference

2) How to mark right answers and wrong answers ?

- Japan: 1+2 = 3 ✓ 1+3 = 5 ✓
- US: 1+2 = 3 ✓ 1+3 = 5 ✓

Don’t take anything granted

	right	wrong
Japan	○	✓、×
Korea	○	×
US、France、Italy、China、India、、	✓	○、×
Germany	✓、 (r)	f、(underline)、vertical bars
Russia	(nothing)	×、(underline)

3) Very important Japanese symbols:

◎　○　△　×

"Let me know if you can join us for a drink tonight. Are you ◎、○、△、or × ?"

"Sounds nice ! Surely I am ◎. "

	◎	○	△	×	group scheduling in Japan		
2013/8/26(月)	1	2	0	0	◎	○	○
2013/8/27(火)	0	1	2	0	△	△	○
2013/8/28(水)	1	2	0	0	○	◎	○
2013/8/29(木)	2	1	0	0	○	◎	◎
2013/8/30(金)	0	0	0	3	×	×	×

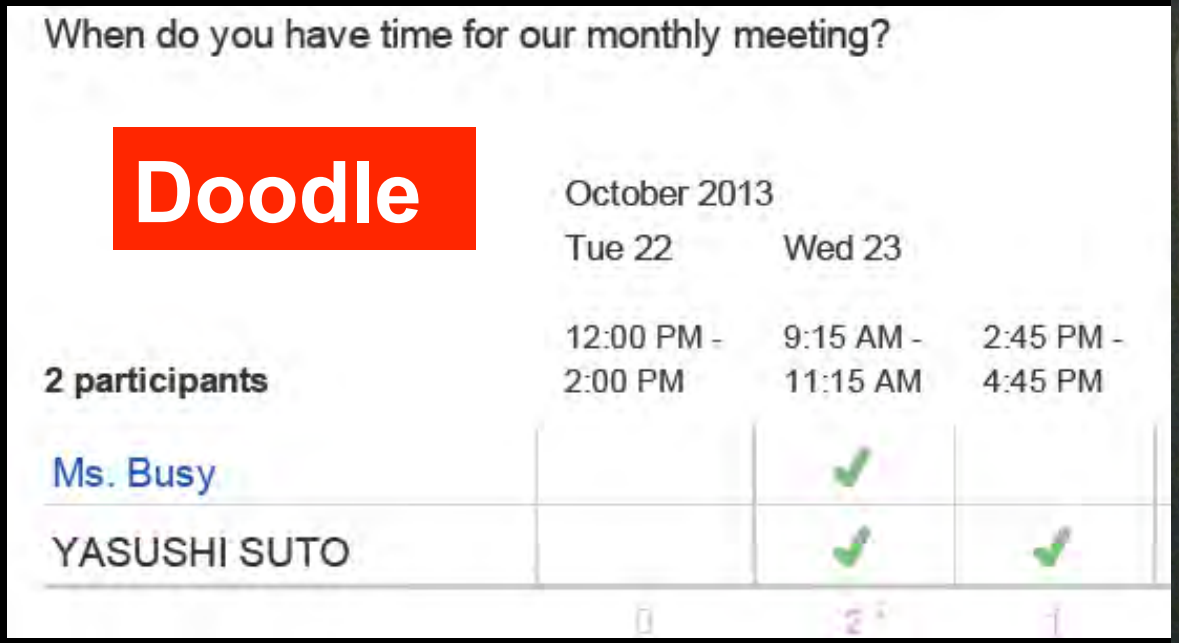
Definite meanings in Japan:

◎ ○ △ ×

Most Japanese believe that the following meanings are universal all over the world

◎	wonderful, great
○	good, correct, right
△	uncertain, not so good
×	bad, wrong
✓	wrong (sometimes)

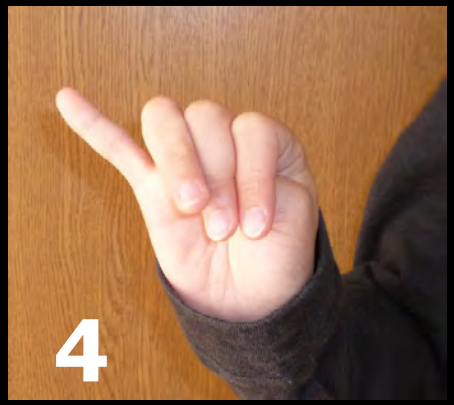
Very misleading if you do not know



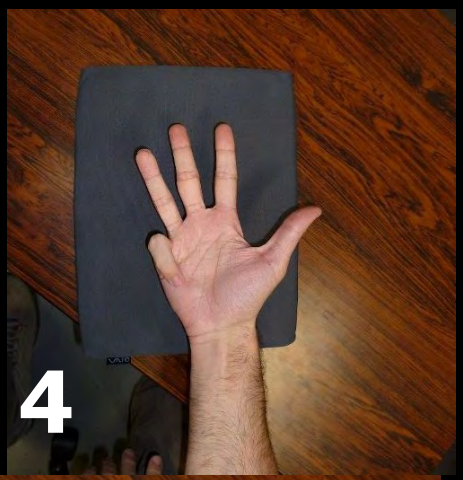
- Does ✓ mean good or bad ?
- Which is recommended, ○ or × ?

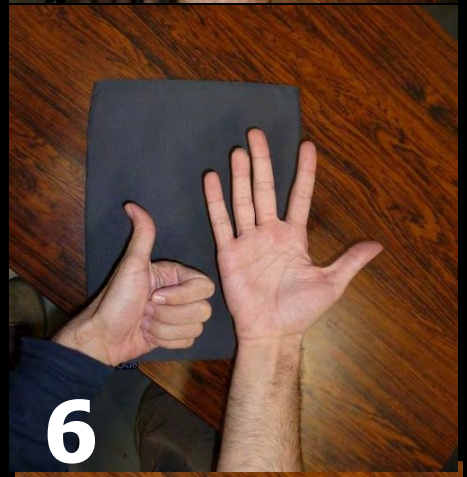
4) How to count on your fingers ?

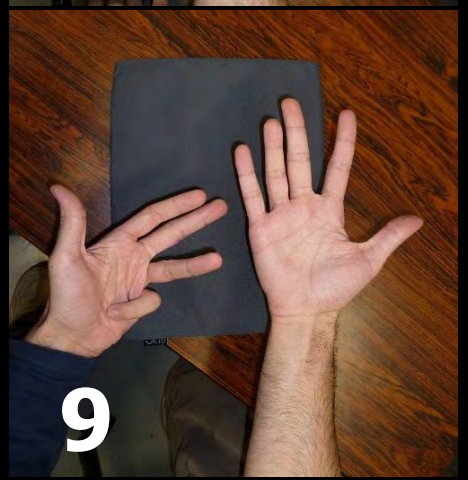
- 一 二 三 四 五 六 七 八 九 十
- Ⅰ Ⅱ Ⅲ Ⅳ Ⅴ Ⅵ Ⅶ Ⅷ Ⅸ Ⅹ
- 1 2 3 4 5 6 7 8 9 10
  - One, two and three should imply merely vertical/horizontal bars. Why not in Arabic numerals ?
  - Does the difference among the characters originate from different ways of counting on one's fingers ?



How to count in Japan

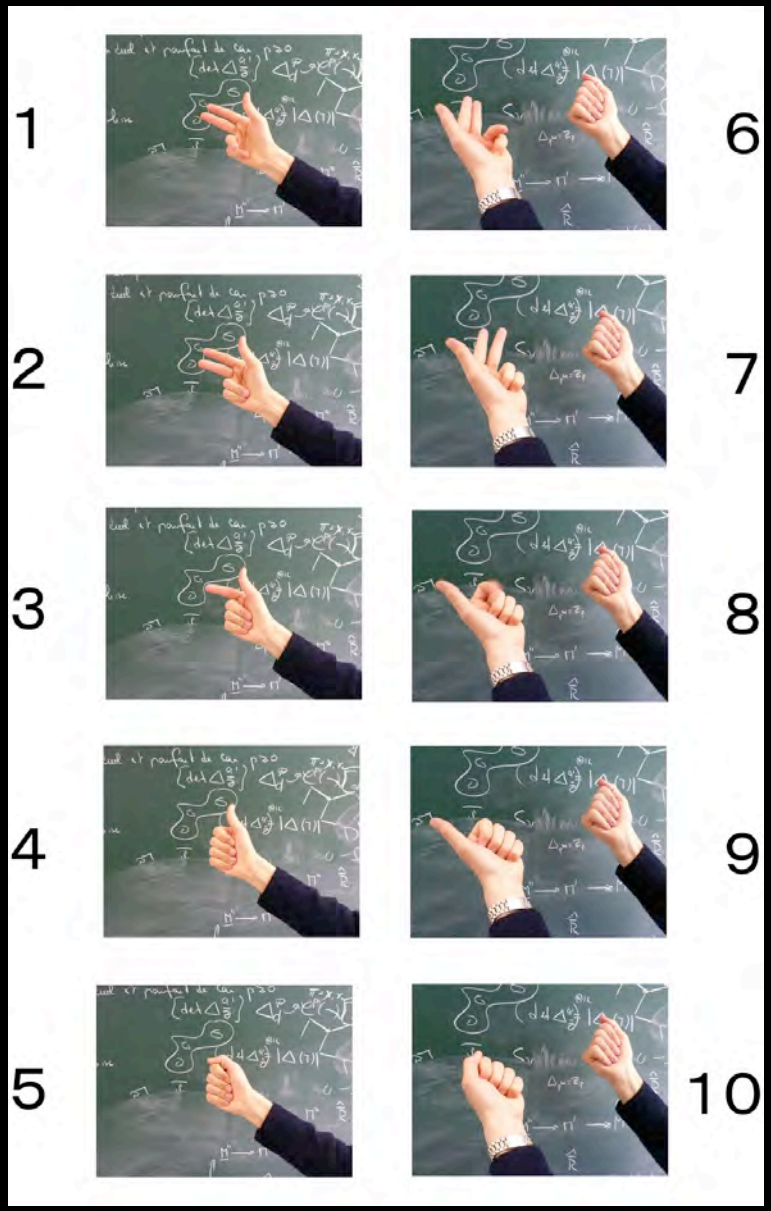


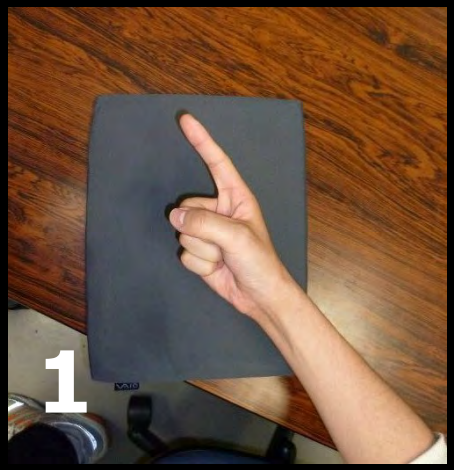


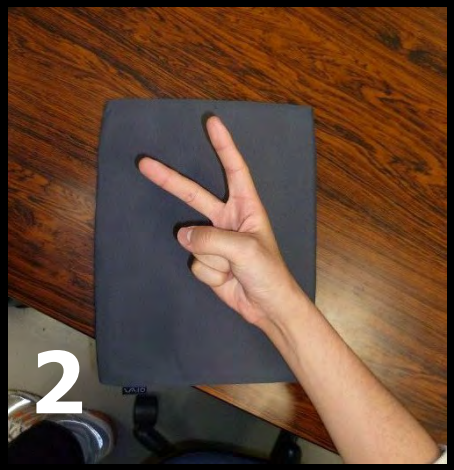


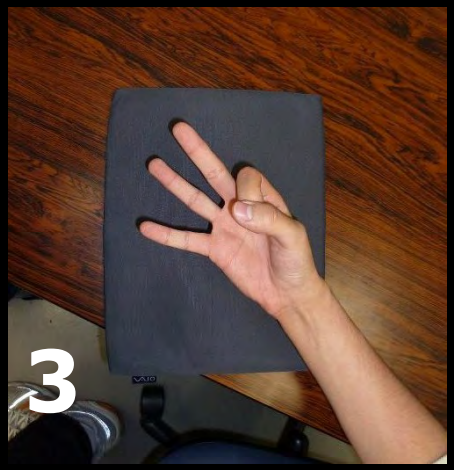
How to count in France

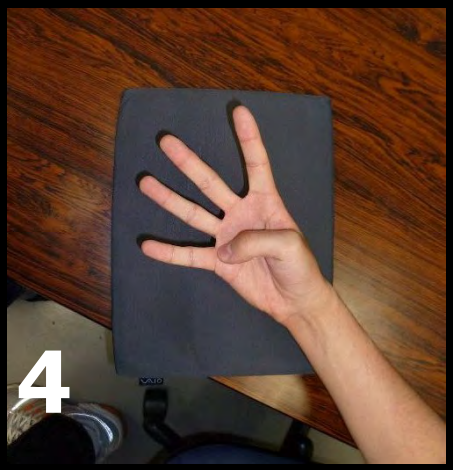
How to count in Tunisia

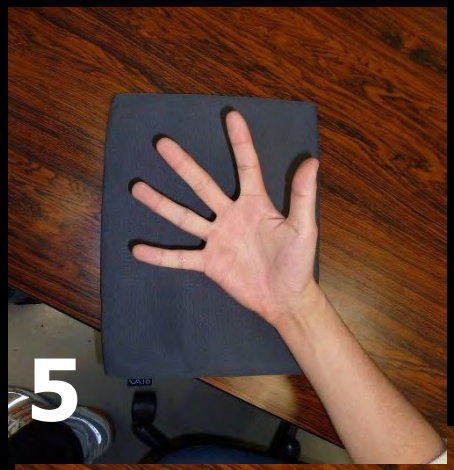


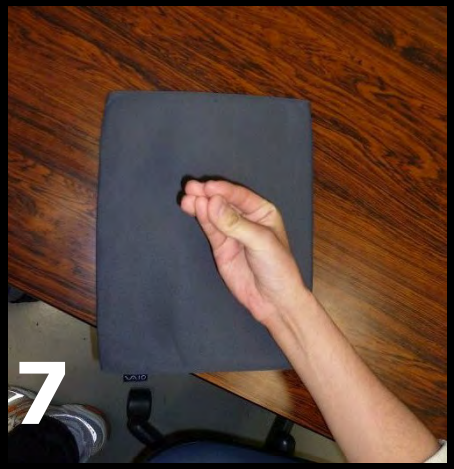


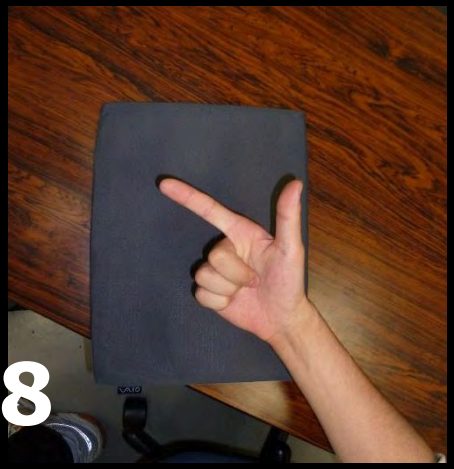


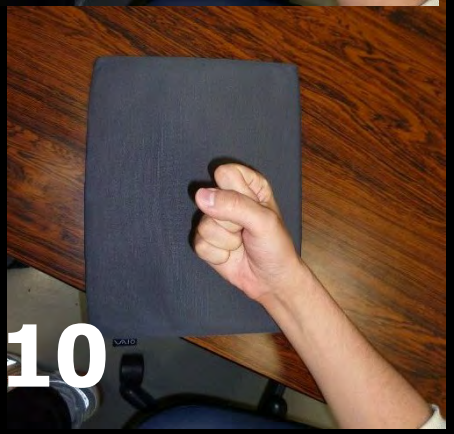












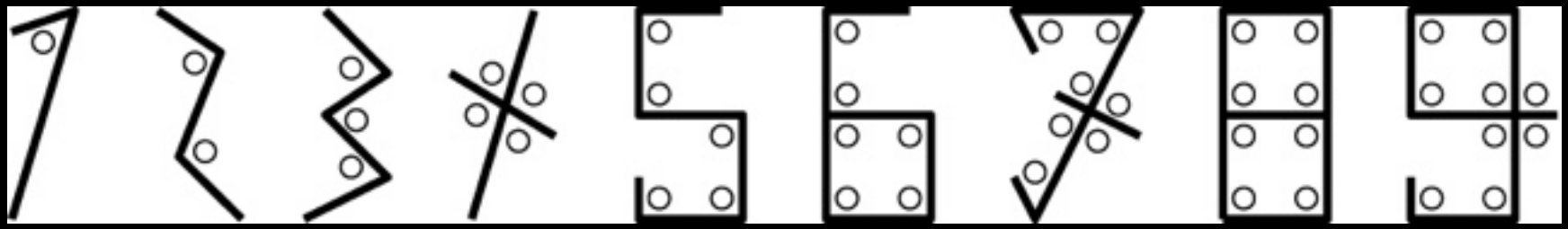
How to count in China

How to count in India (1)

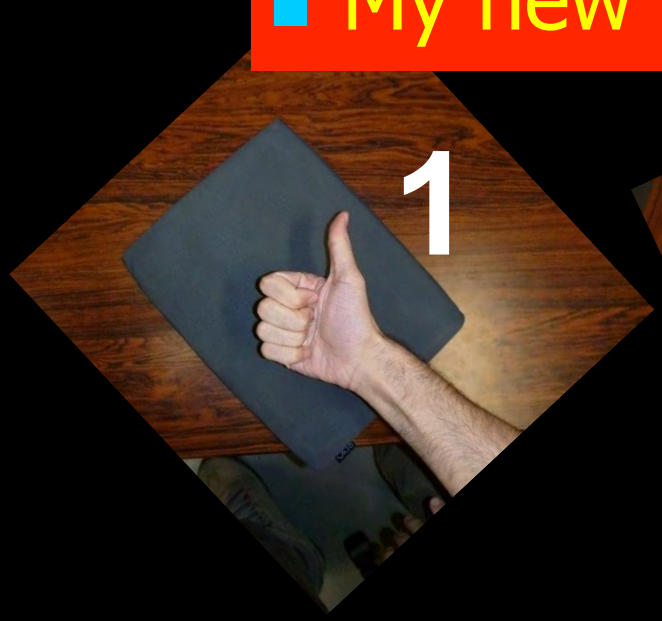
How to count in India (2)

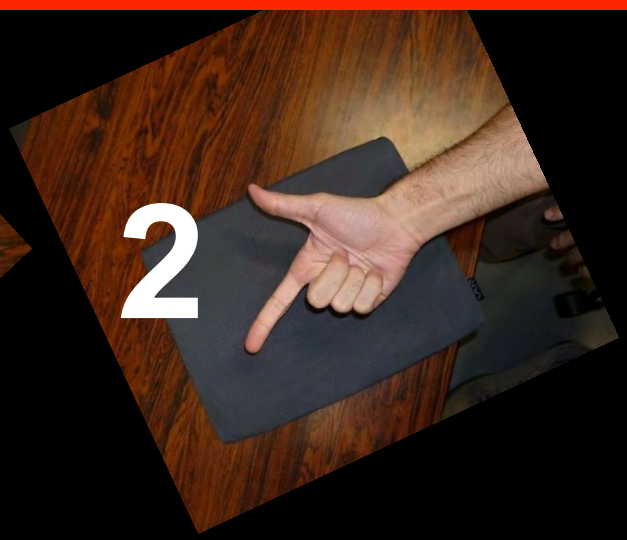
Origin of Arabic numerals ?

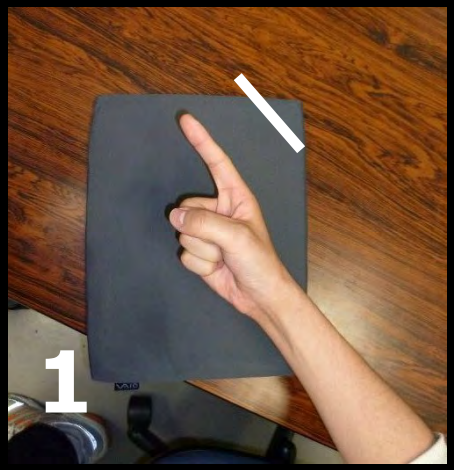
- Conventional interpretation: number of angles

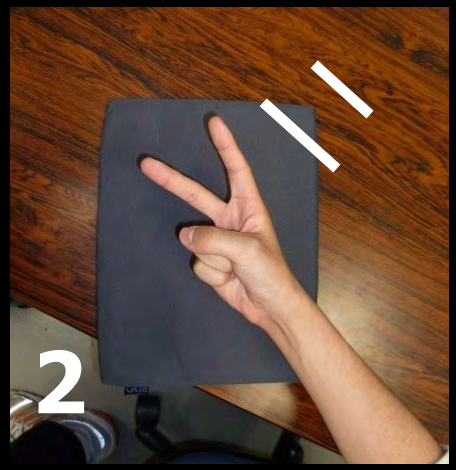


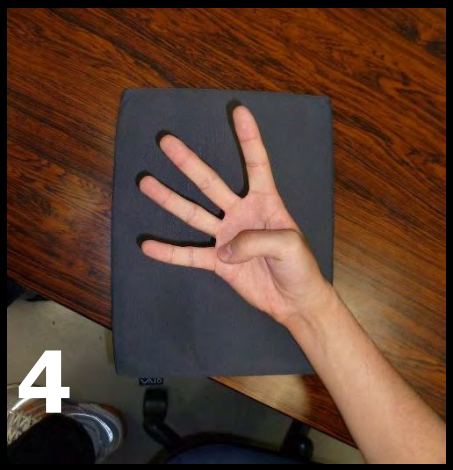
- My new hypothesis: fingers

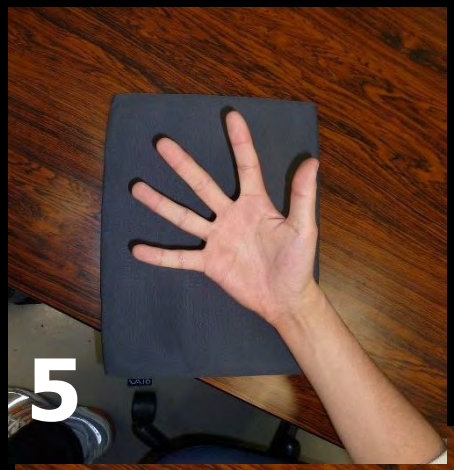


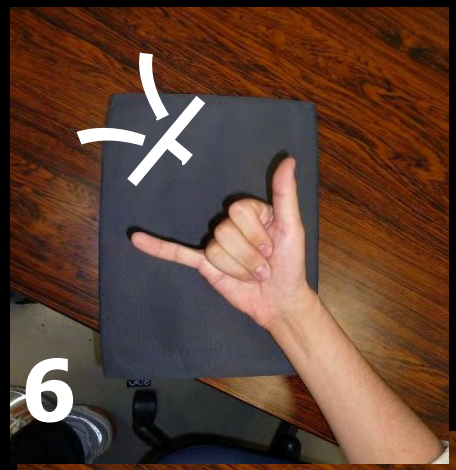


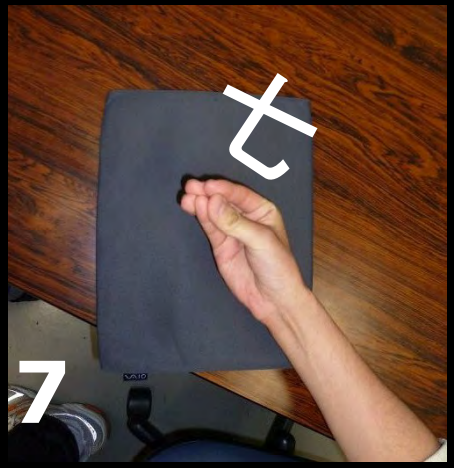


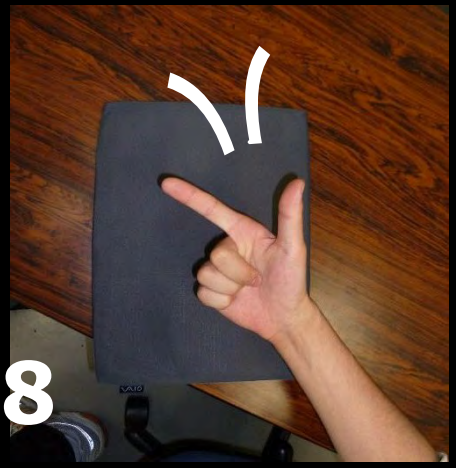


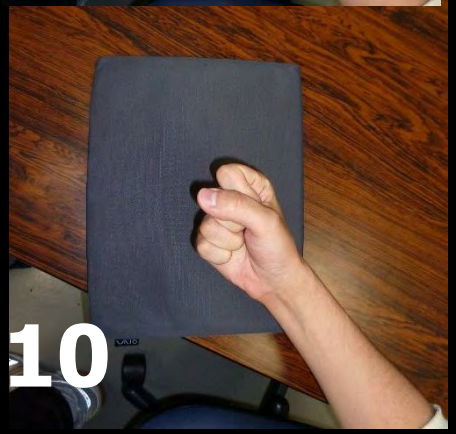












My theory works nicely for Chinese counting ! (Suto 2008; unpublished)

Asahi Shogakusei Shimbun: November 3, 2011

- Daily newspaper for elementary school students in Japan

3　2011年(平成23年)11月3日　木曜日　朝日小学生新聞　(第三種郵便物認可)

	1	2	3	4	5	6	7	8	9	10
日本										
フランス										
中国										
インド										
チュニジア										

(注) 日本は通常2種類の数え方があります。自分用に数えると　節に置いて「1」、下から二番目の小指の関節で「2」というやり

世界でいろいろ 指で数える方法

びっくり、中国とインド

「あたりまえだと思っていることも、実はあたりまえではないんです」

こう話すのは、東京大学の須藤靖教授。あるときドイツから招いた研究者のホテルを予約しようと、宿泊数を指折り確認していたところ、「数え方がちがうんだね」と指摘されました。これをきっかけに留学生らに聞き取りを開始。成果を東京大学出版会の広報誌にのせました。結果は左の写真のとおりです。

「おどろいたのが中国とインド」と須藤先生。中国は六以降は変則的でパッとはわからなくなります。

インドは「指折り」ですらなく、指の関節の位置を利用します。手のひらに近い

一、二、三、四……。指を折り曲げて数えるやり方は、世界のどこでも同じだと思っていませんか。実は地域によって、かなりちがいがありそうです。どんなやり方があるのか、探ってみました。(沢辺 雅俊)

須藤靖・東大教授。「とてもおどろいた」という中国の数え方から「7」の形をまねてもらいました＝東京都文京区の同大で

5) How to reply to the everyday question: “how are you ?”

- US: Fine, Great, Wonderful, Terrific
- Japan: as usual (あいかわらずです)

  Not so good, not so bad

  （まあまあです）

  Miserable indeed（全くあきまへんなあ）

Why do you ask ? "How are you ?"

- In the US, it seems that everyone is supposed to reply like "Fine or Great ! "
  - Do Americans really feel "great" every day ?
- The Japanese rarely ask such a question
  - We say, good morning, nice to see you, etc.
  - Japanese do not expect any reply because we know it is entirely meaningless
  - I have never referred to my situation as "Great" (at least in Japanese)

Japanese is indeed distorted !

- To express politeness in Japanese, we have to praise you and/or degrade ourselves (= principle of relativity)
  - Totally unacceptable: "This is my wonderful wife/husband" *(sounds very ill-educated)*
  - Fine: "You have a very nice wife/husband" *(sounds reasonably well-educated)*
  - *Terrific!*: "This is my stupid wife/husband/son", "This is a miserable gift from us. I doubt you like it" *(sounds impressive, implying that we are indeed amazingly well-educated !)*
- Sharp boundary between inside and outside

British(English) is similarly distorted

- My experience with a British friend
  - British

    This doesn't sound unreasonable.
  - Japanese

    That sounds very British to me. Is it equivalent to **"That's great"** in American English ?
  - British

    Indeed. I don't know how, but it seems to be something Brits absorb very early: you can never just say what you mean, but have to imply it. *The more obscure you can be while still communicating the message, the better. Silly game!*

Neither is better nor worse; we should try to understand, enjoy and respect the different cultures

Princeton-JSPS conference dinner at "Triumph" on Nov. 10, 2009

From
After Dark
to
Beyond Dark

I once read a story about three brothers who washed up on an island in Hawaii.

- Three brothers went out fishing and got caught in a storm. They drifted on the ocean for a long time until they washed up on the shore of an uninhabited island. It was a beautiful island with coconuts growing there and tons of fruit on the trees, and a big, high mountain in the middle.

(Haruki Murakami "After Dark", English translation by Jay Rubin)

The night they got there, a god appeared in their dreams and said

- A little farther down the shore, you will find three big, round boulders. I want each of you to push his boulder as far as he likes. The place you stop pushing your boulder is where you will live. The higher you go, the more of the world you will be able to see from your home. It's entirely up to you how far you want to push your boulder.

The youngest brother quit first. He said

- Brothers, this place is good enough for me. It's close to the shore, and I can catch fish. It has everything I need to go on living. I don't mind if I can't see that much of the world from here.

His two elder brothers pressed on, but when they were midway up the mountain, the second brother quit. He said

- Brother, this place is good enough for me. There is plenty of fruit here. It has everything I need to go on living. I don't mind if I can't see that much of the world from here.

The eldest brother continued walking up the mountain. The trail grew increasingly narrow and steep, but he did not quit.

- He wanted to see as much of the world as he possibly could, so he kept rolling the boulder with all his might. He went on for months, hardly eating or drinking, until he had rolled the boulder to the very peak of the high mountain.

There he stopped and surveyed the world. Now he could see more of the world than anyone.

- This was the place he would live — where no grass grew, where no birds flew. For water, he could only lick the ice and frost. For food, he could only gnaw on moss. But he had no regrets, because now he could look out over the whole world.
- And so, even today, his great, round boulder is perched on the peak of that mountain on an island in Hawaii.

Mari asks, "Is it supposed to have some kind of moral?"

- Takahashi says, "Two, probably.
- The first one," he says, ***holding up a finger,*** "is that people are all different. Even siblings.
- And the other one," he says, ***holding up another finger***, "is that if you really want to know something, you have to be willing to pay the price."

Mari offers her opinion: "To me, the lives chosen by the two younger brothers make the most sense."

- "True," he concedes. "Nobody wants to go all the way to Hawaii to stay alive licking frost and eating moss. That's for sure. But the eldest brother was curious to see as much of the world as possible, and he couldn't suppress that curiosity, no matter how big the price was he had to pay"
- ***"Intellectual curiosity."***
- "Exactly." *English translation by Jay Rubin*

Intellectual curiosity

- "True," he concedes. "***Nobody wants to go all the way to Hawaii to stay alive licking frost and eating moss.*** That's for sure. But the eldest brother was curious to see as much of the world as possible, and he couldn't suppress that curiosity, no matter how big the price was he had to pay"

Nobody wants to go all the way to Hawaii to stay alive licking frost and eating moss.

Nobody

Indeed, we are *the* ***Nobody*** !

Three big “Boulders”
@summit of Mauna Kea
Hawaii

Subaru telescope

Youngest brother @sea shore, Hilo, Hawaii

one of my former *stupid* students

Second Brother
@2800m above sea level

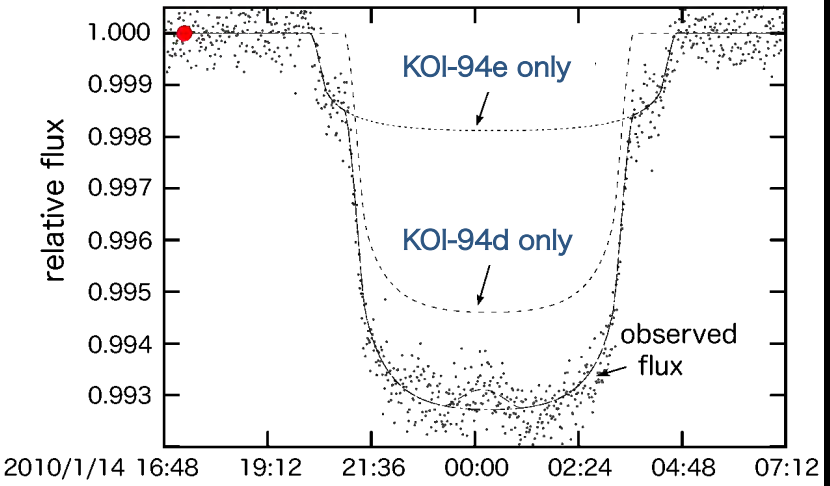
Eldest brother
@4200m above sea level

He saw more of the world

He saw more of the world

He saw more of the world

What we saw from Mouna Kea *after dark*
the first discovery of planet-planet eclipse



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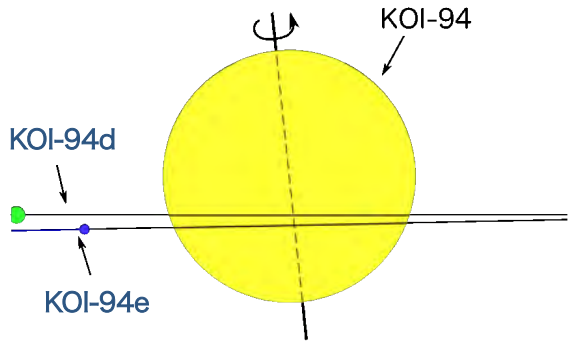
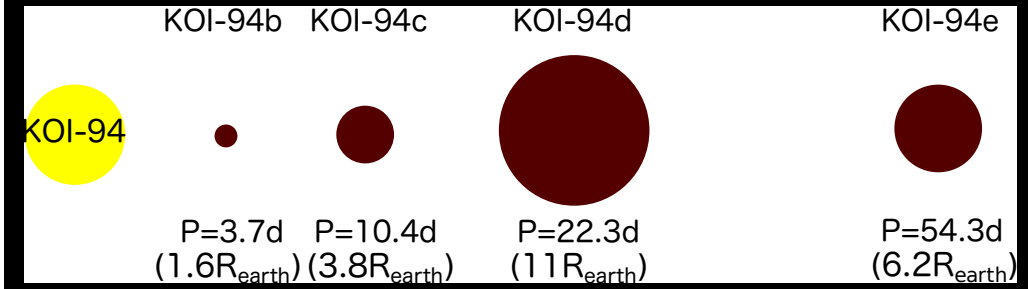
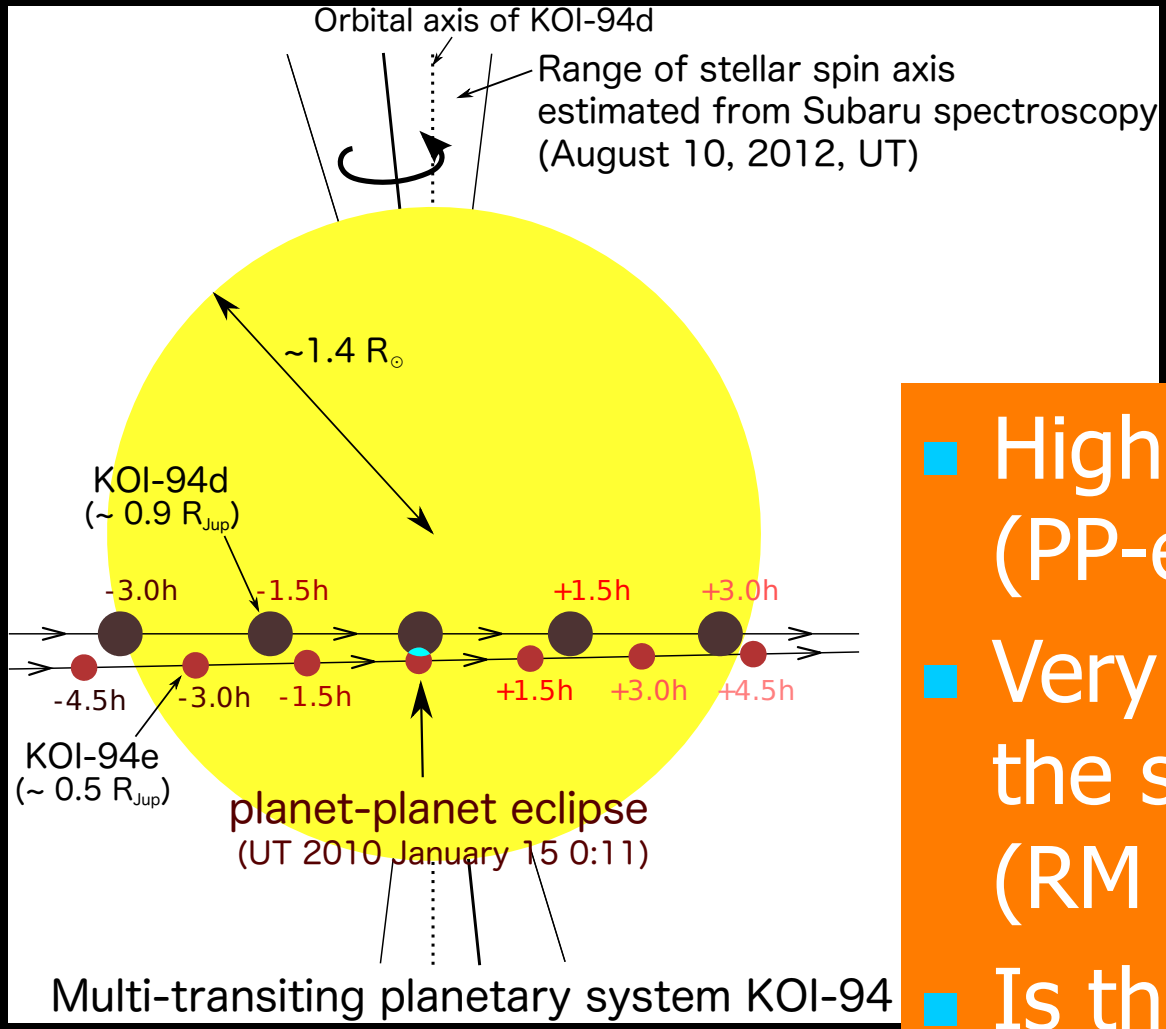




- KOI-94: 4 transiting planets (Kepler-Object-of Interest)
- Two planets (d and e) overlapped each other on Jan.14, 2010 (Hirano et al. 2012) PP eclipse
- Totally unexpected

Mercury and Venus are predicted to double-transit the Sun on July 26th, 69163 AD.

Architecture of the multi-planet system



- Highly coplanar orbits (PP-eclipse)
- Very well aligned with the stellar spin axis (RM effect)
- Is this surprising or not surprising at all ?

The Astrophysical Journal, 622:1118–1135, 2005 April 1

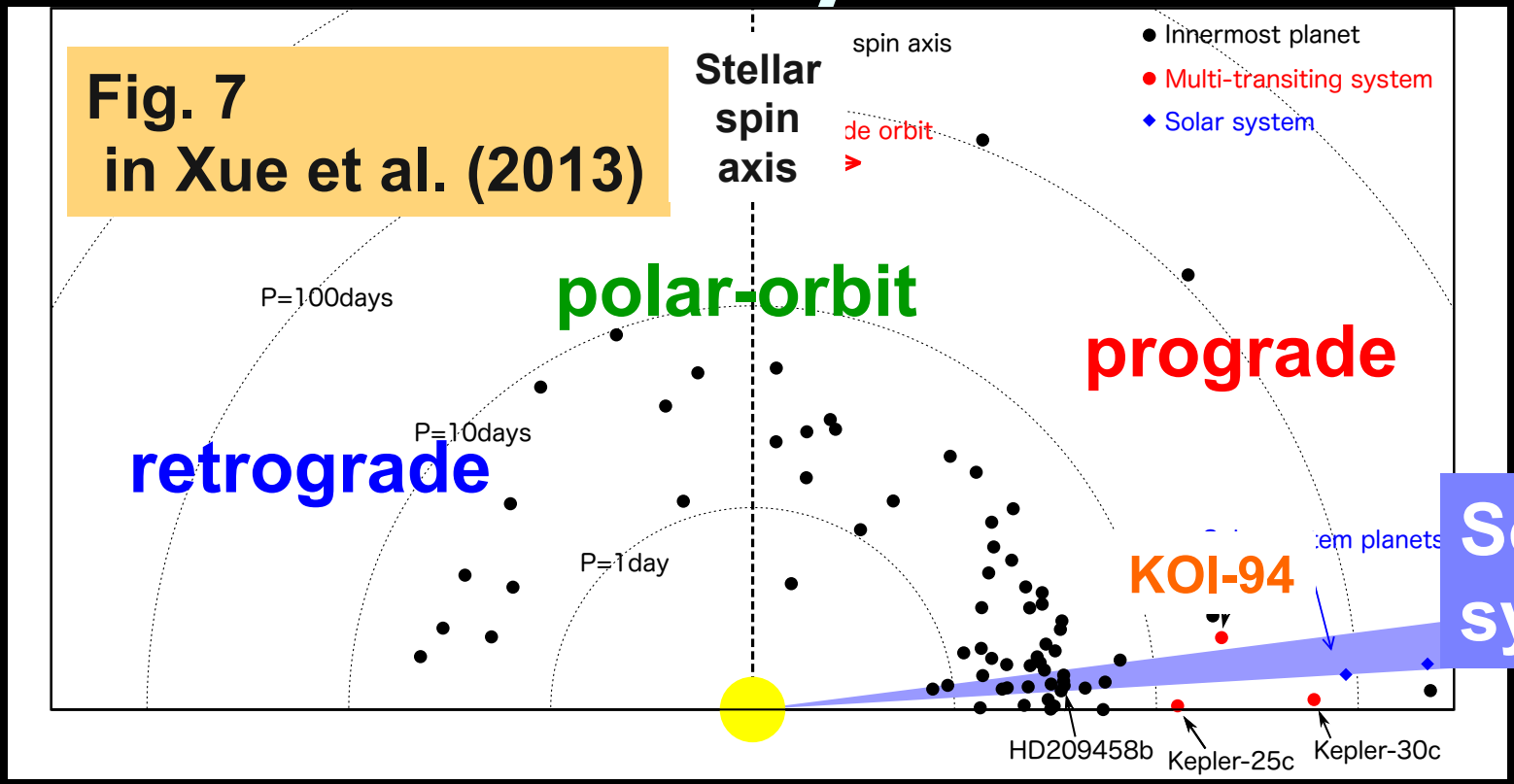
Ohta, Taruya & Suto: ApJ 622(2005)1118

THE ROSSITER-McLAUGHLIN EFFECT AND ANALYTIC RADIAL VELOCITY CURVES FOR TRANSITING EXTRASOLAR PLANETARY SYSTEMS

Yasuhiro Ohta, Atsushi Taruya,[1] and Yasushi Suto[1]

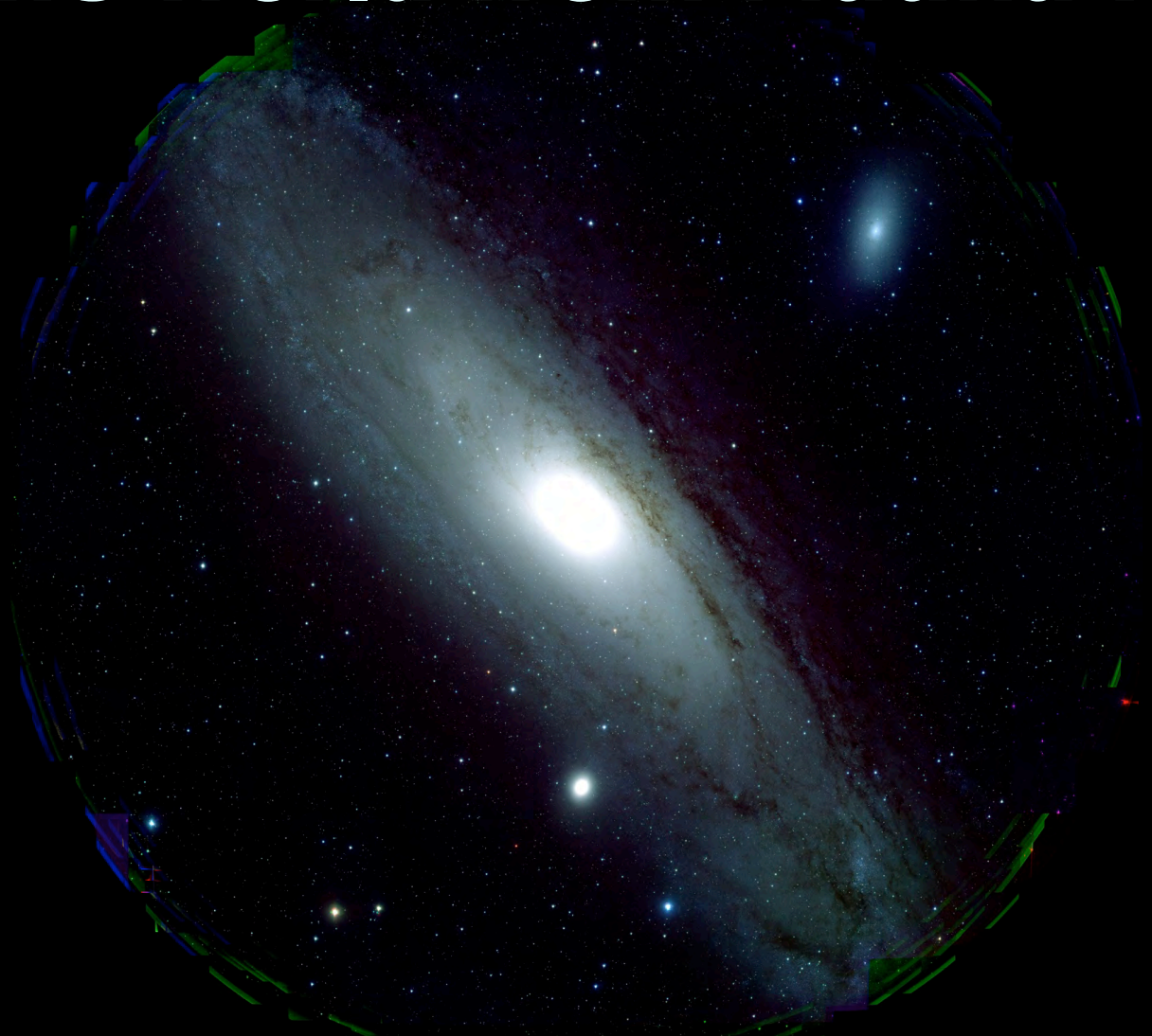
- In the final section of the paper, I wrote
  - Although it is unlikely, we may even speculate that a future RM observation may discover an extrasolar planetary system in which the stellar spin and the planetary orbital axes are antiparallel or orthogonal.
  - While it is premature to discuss such extreme possibilities at this point, the observational exploration of transiting systems using the RM effect is one of the most important probes for a better understanding of the origin of extrasolar planets.

I was totally wrong !
spin-orbit misalignment turned out to be fairly common



- We were able to see a bit more of the world
  - **Unsolved problems**: formation, evolution, and migration mechanism of planets

We are planning to see even more of the world from Mauna Kea



http://www.naoj.org/Topics/2013/07/30/index.html

Hyper Suprime-Cam Survey will start soon: collaboration among Japan, Taiwan and Princeton

Typical Apparent Diameter of the Moon (0.5 degrees)

Suprime-Cam
First Light Release
January 1999

Suprime-Cam
Image Release
September 2001

Hyper Suprime-Cam
Image Release
July 2013

Summary

Nightfall: We didn't know anything

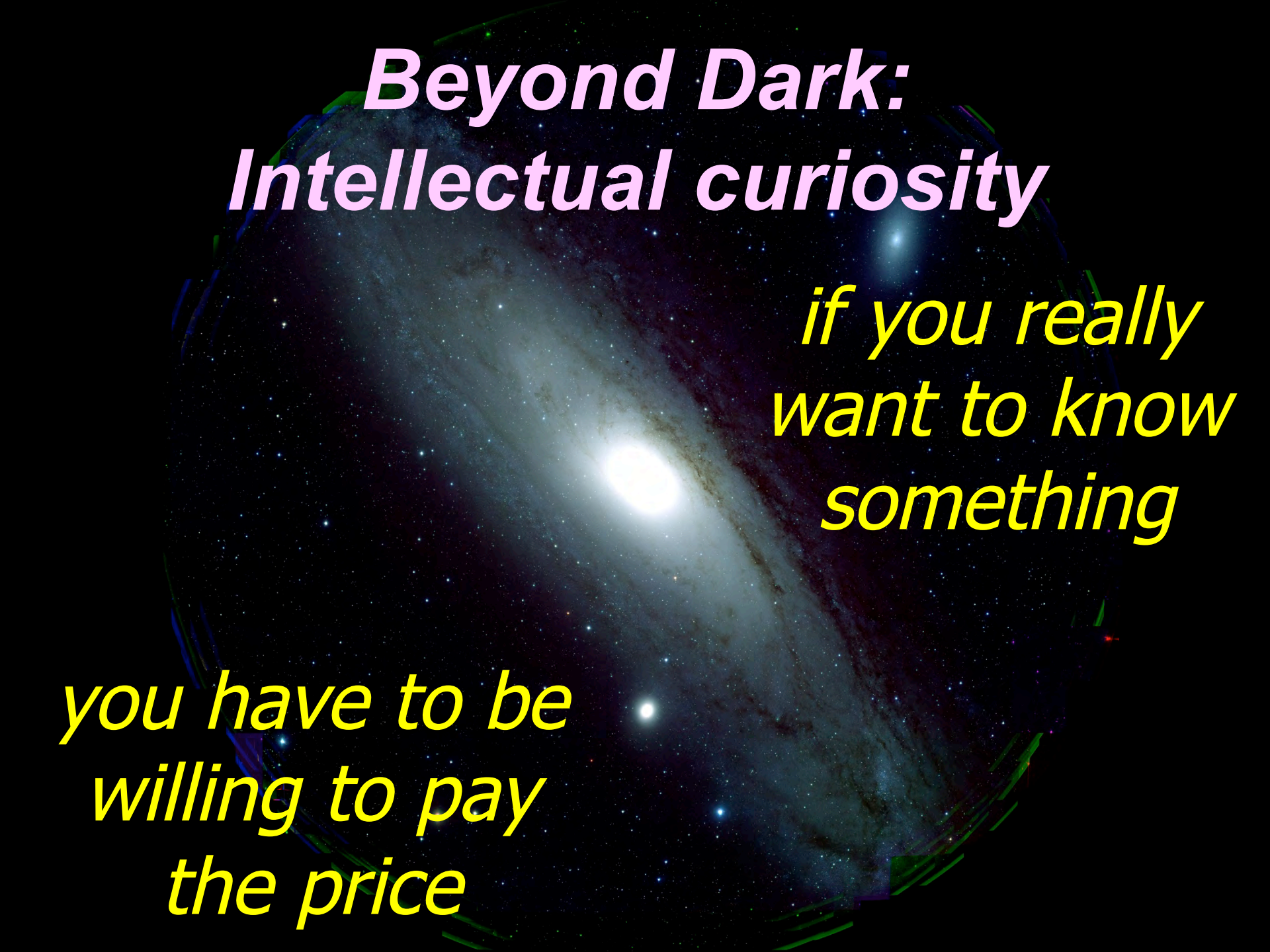
- No "night" except the total eclipse due to another planet every 2049 years on the planet "Lagash"
- People realized the true world for the first time through the darkness full of stars

A goal of science

- To answer the (known) fundamental questions
  - No doubt, but is that all ?
- It is equally, or even more, important *to discover unknown fundamental questions, or to recognize that we didn't understand anything*
- *学問* (Gaku Mon)
  - No good counterpart in English (academia ? Learning ?)
  - 学 (Gaku) is to learn, and 問 (Mon) is to ask
  - Indeed you can ask questions only after you learn something seriously. Learning without asking later does not bring any future progress.

Conclusions (if any)

- Despite such huge differences in culture, scientists all over the world can work together in order to see more of the world, and to confirm that we did not know anything.
- To me, this is quite amazing, but it may just point to the reassuring fact that science is the same all over the world, purely driven by intellectual curiosity.
- Astronomy may not be useful but useless. It is not even merely valuable but significantly **in**valuable.


Beyond Dark:
Intellectual curiosity
if you really want to know something
you have to be willing to pay the price