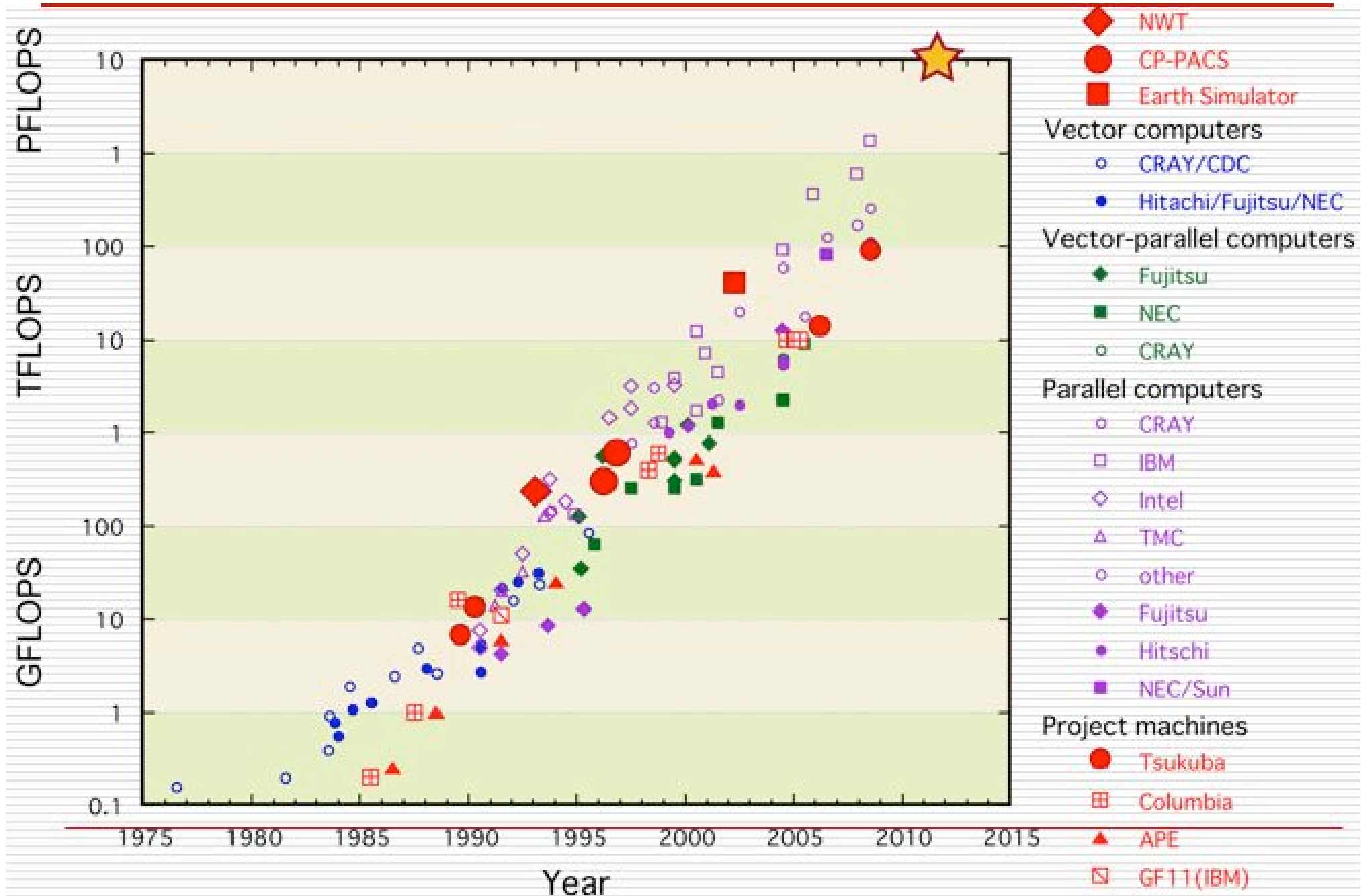


# Computing Facilities in Japan

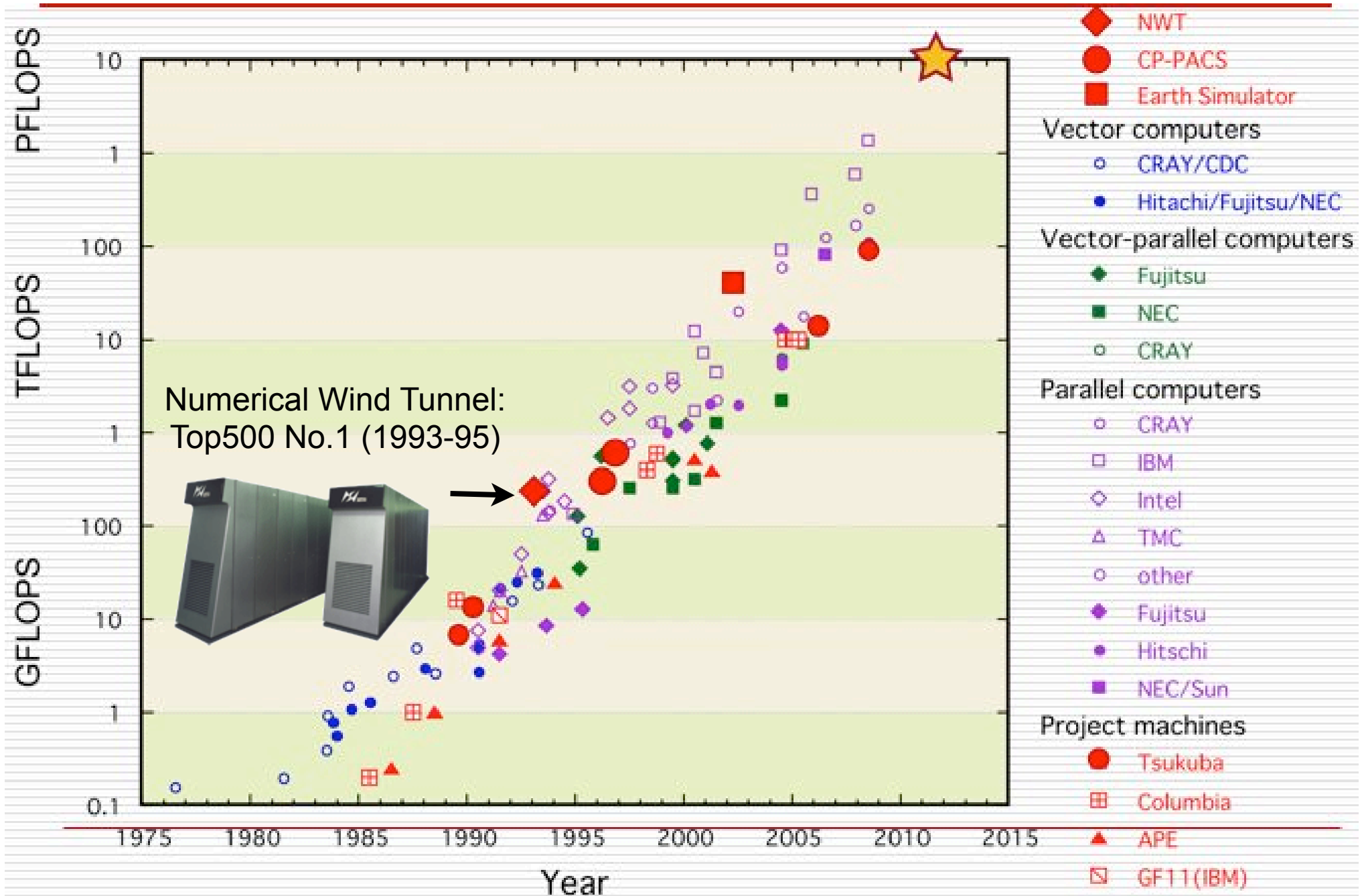
Sinya Aoki  
University of Tsukuba

The first ANPhA Symposium  
Jan. 18-19, 2010  
J-PARC, Tokai, Japan

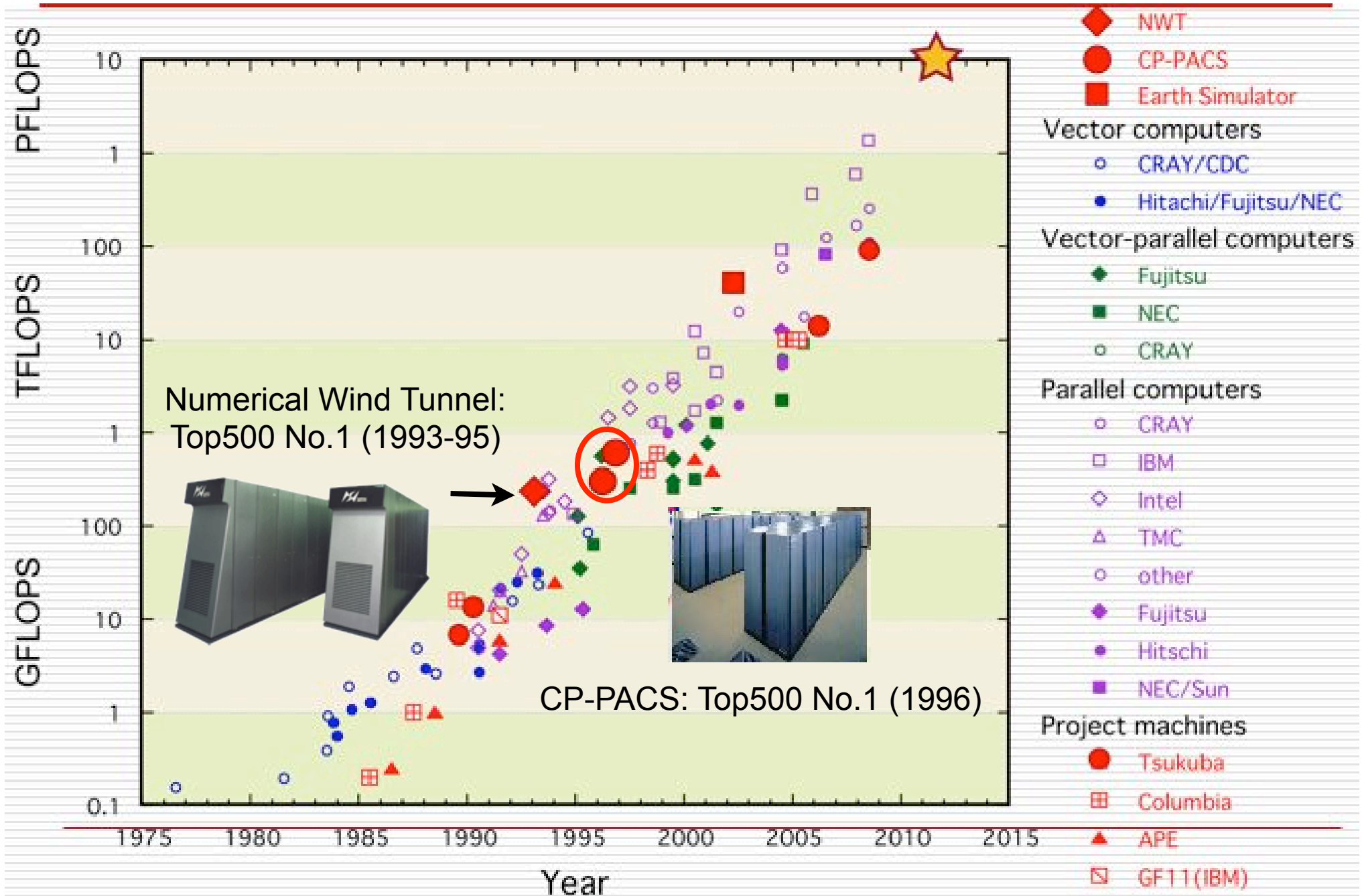
# Development of supercomputers



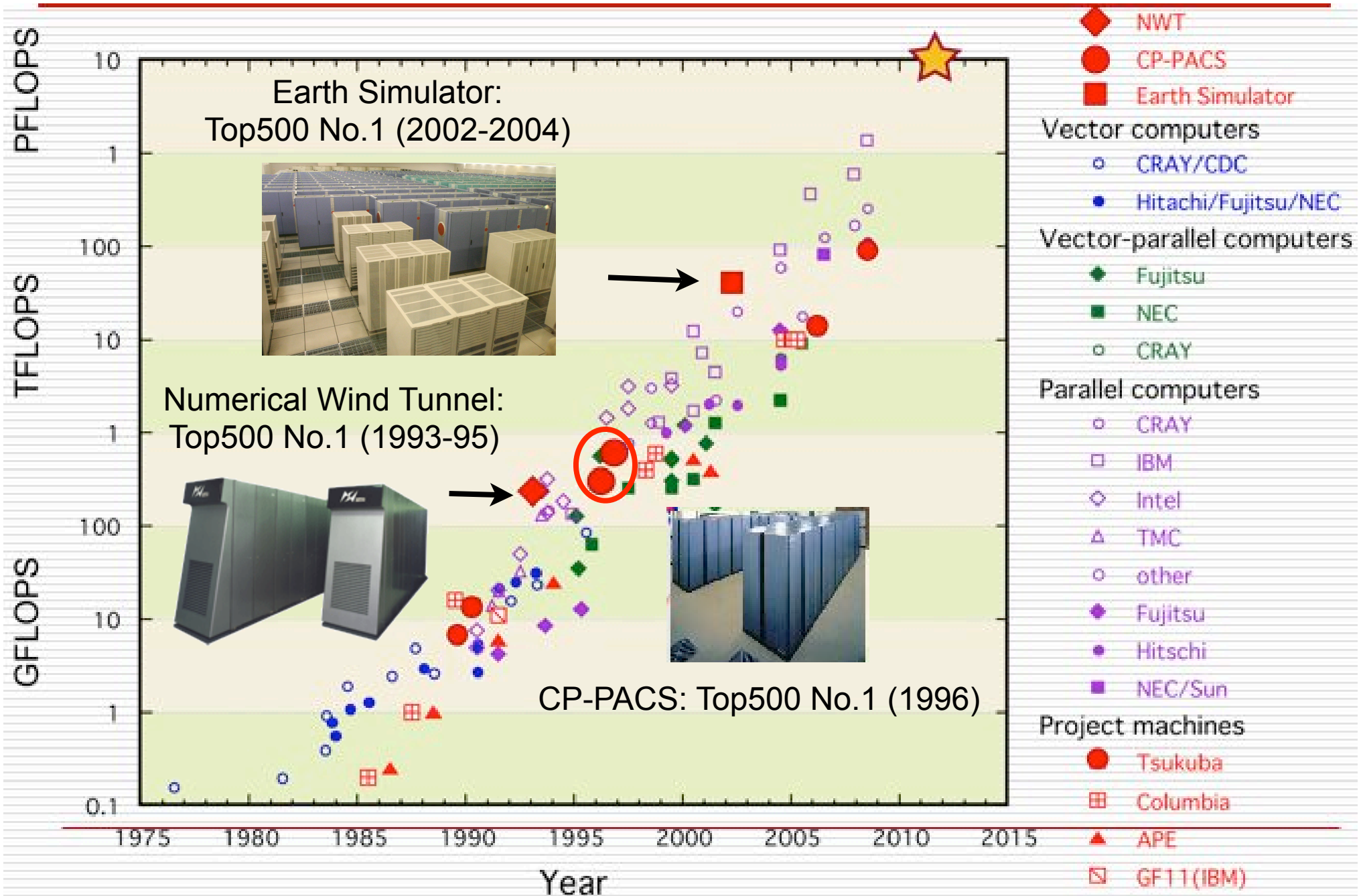
# Development of supercomputers



# Development of supercomputers



# Development of supercomputers



# Supercomputers vs. Accelerator

Speed

Luminosity

Memory

Energy (?)

Vector, Parallel

Linear, Ring

Application program

Detector

Recent trend: less vector, more parallel

# Computer Facilities in Japan for Particle-, Nuclear-, and Astro- Physics

- Research Center for Computational Science, University of Tsukuba
- Computing Research Center, KEK
- Center for Computational Astrophysics, National Astronomical Observatory of Japan
- Yukawa Institute for Theoretical Physics, Kyoto University
- Research Center for Nuclear Physics, Osaka University
- Japanese Next Generation Supercomputer Project

# Research Center for Computational Science, University of Tsukuba

## 1. PACS-CS

parallel



2560 CPU  
14.3TFlops  
5.0 TByte

## 2. T2K-Tsukuba

parallel



648 nodes  
10,368 CPU  
95.39TFlops  
20.0 TByte

## 3. FIRST

parallel+



256 nodes/496CPU  
+240 Blade GRAPE  
3.1 + 33.0 TFlops



Blade GRAPE



# Computing Research Center, KEK

1. Hitachi SR11000 K1

parallel



16 nodes/ 256 CPU  
2.15TFlops, 0.5 TByte

2. IBM Blue Gene/L

parallel



10,240 nodes/20,480 CPU  
57.3TFlops, 5.0 TByte

# Center for Computational Astrophysics, National Astronomical Observatory of Japan

## 1. CRAY XT-4

parallel



740 nodes/ 2960 CPU  
2.6TFlops, 5.7TByte

## 2. NEC SX-9

vector-parallel



16 CPU  
1.6TFlops, 1.0 TByte

# Yukawa Institute for Theoretical Physics, Kyoto University

## 1. NEC SX8

vector-parallel



6 nodes/ 48 CPU  
768GFlops, 768GByte

## 2. SGI Altix3700

parallel



64 CPU  
410GFlops, 256GByte

# Research Center for Nuclear Physics, Osaka University

## 1. NEC SX8R

vector-parallel



8 nodes/ 64 CPU  
2.2TFlops, 2.0TByte

4 nodes/ 32 CPU  
1.0TFlops, 0.5TByte

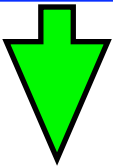
2 nodes/ 16 CPU  
0.5TFlops, 128GByte

# Nation-wide usage programs

All facilities mentioned so far can be used for physicist in Japan without any charges.

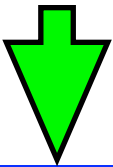
proposal

to each institute, once or twice/year



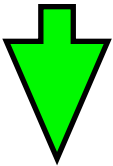
hearing

some institutes, if necessary



decision for time allocation

by “review” committee at each institute



results

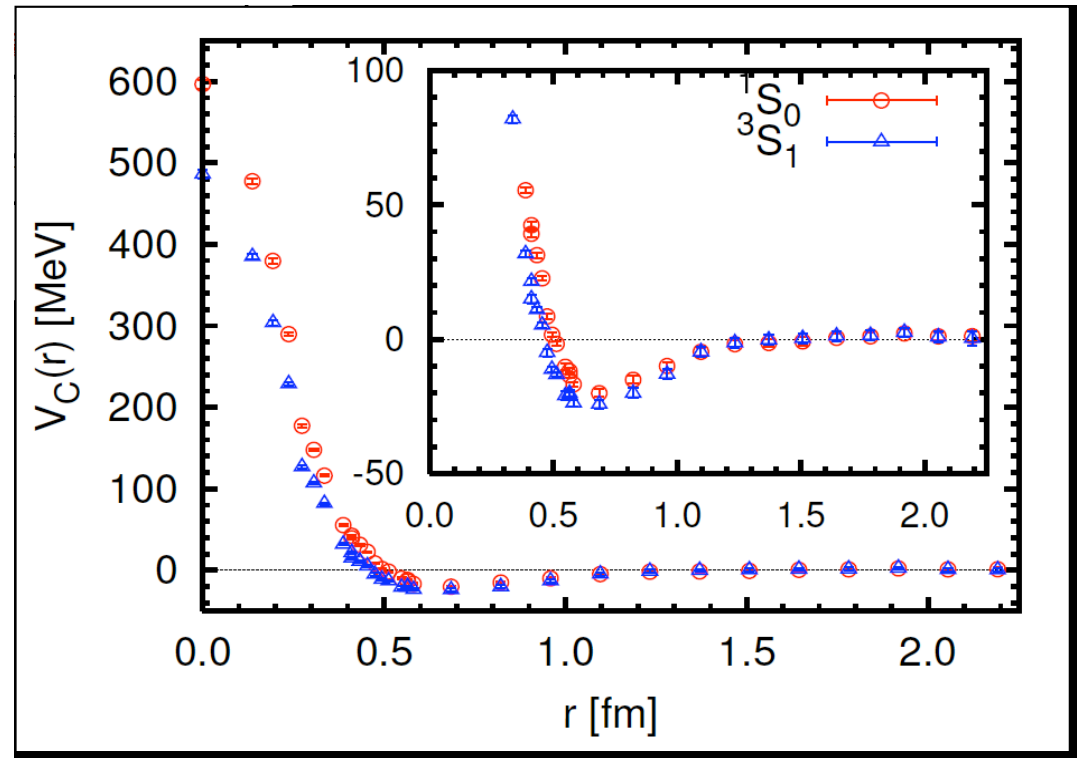
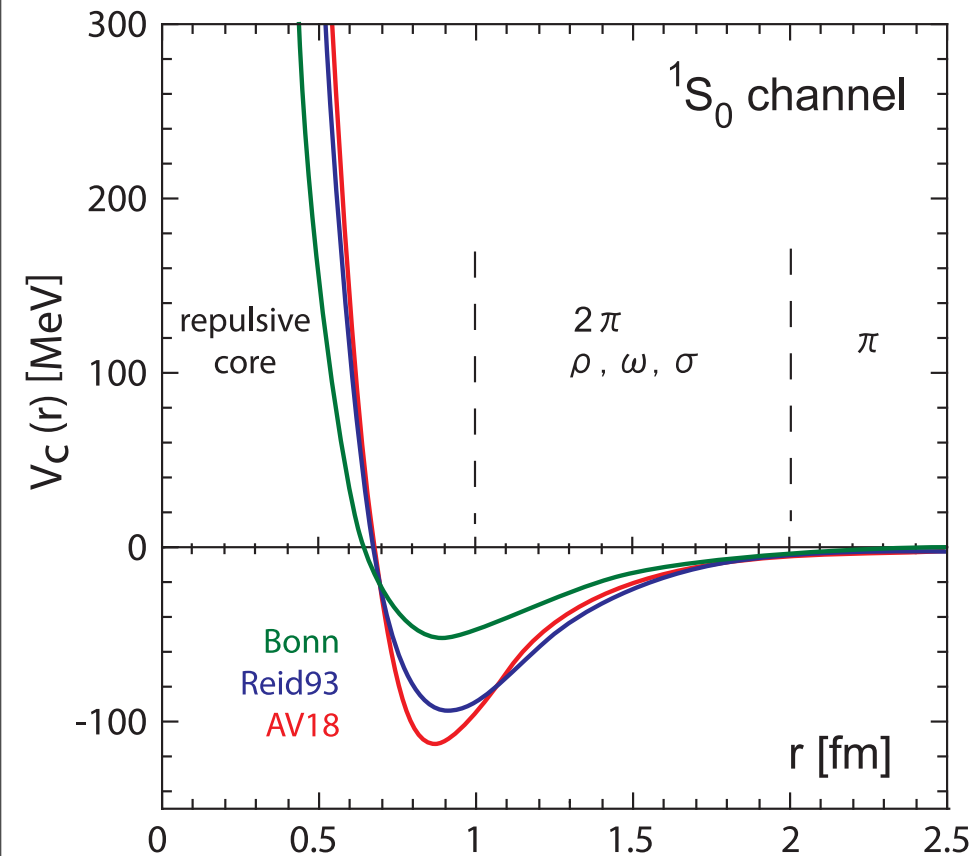
report  
hearing

to each institute, once or twice/year

# example: nucleon-nucleon potential

extraction from experiments

lattice QCD calculation



Ishii-Aoki-Hatsuda, PRL90(2007)0022001

Qualitative features of NN potential are reproduced.

This paper has been selected as one of 21 papers in Nature Research Highlights 2007

Blue Gene/L@KEK has been used.

# Nation-wide Organizations

## 1. Consortium for Computational Fundamental Science

- 2008.5~, <http://www.ccfuns.org>
- “users group”

## 2. Joint Institute for Computational Fundamental Science

- 2009. 2~
- Tsukuba-KEK-NAOJ



## 3. Grant: “Research on the emergence of Hierarchical Structure of Matter by Bridging Particle, Nuclear and Astrophysics in Computational Science” (From quarks to SuperNova explosion)

- 2008-2012, a few M\$

# Next Generation Supercomputer Project

- development of 10 PetaFlops-class system
- research center in computational science
- Period: Japanese FY 2006-2011
- Budget: 115B¥ (1.25B\$)
- RIKEN is responsible for the project