



# R&D managements in JST-ERATO program

## Toward the facilitation of a transformative research

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**ERATO**

- Roles of JST's "Basic Research Program"
- "ERATO" as a "transformative research program"

## 1. Backgrounds

### 2. *Ex ante* evaluation

- Selection of "pioneers" as ERATO Research Directors
- Unique decision-making process for avoidance of "conservative" outputs
- Nominations as the first step



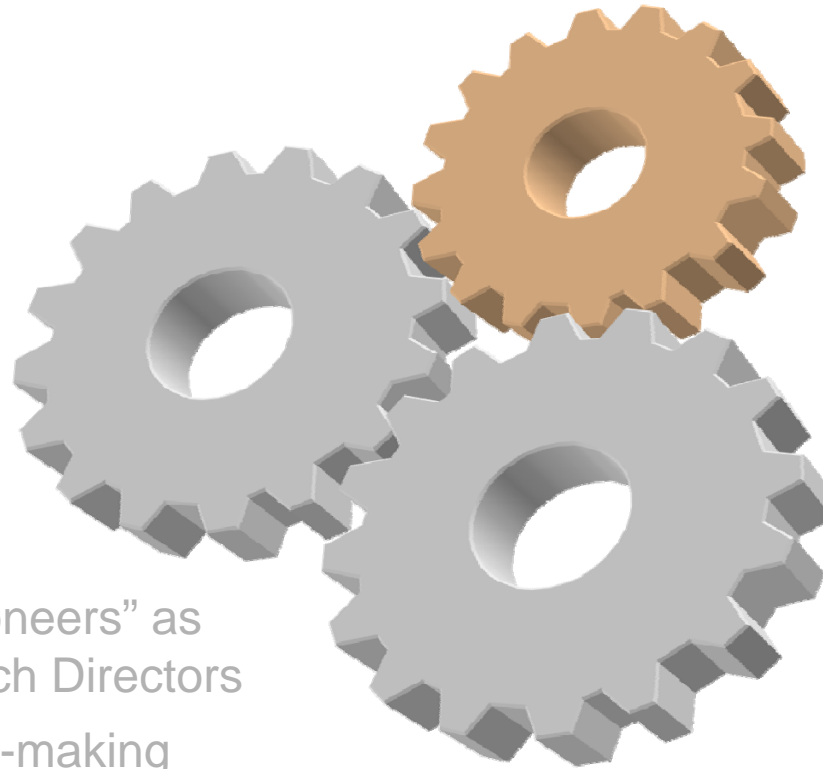
### 3. Research promotion

- Roles of JST headquarters
- Dispatch of supporting staffs
- Flexible funding according to the research plan and progress

- ❑ Roles of JST's "Basic Research Program"
- ❑ "ERATO" as a "transformative research program"

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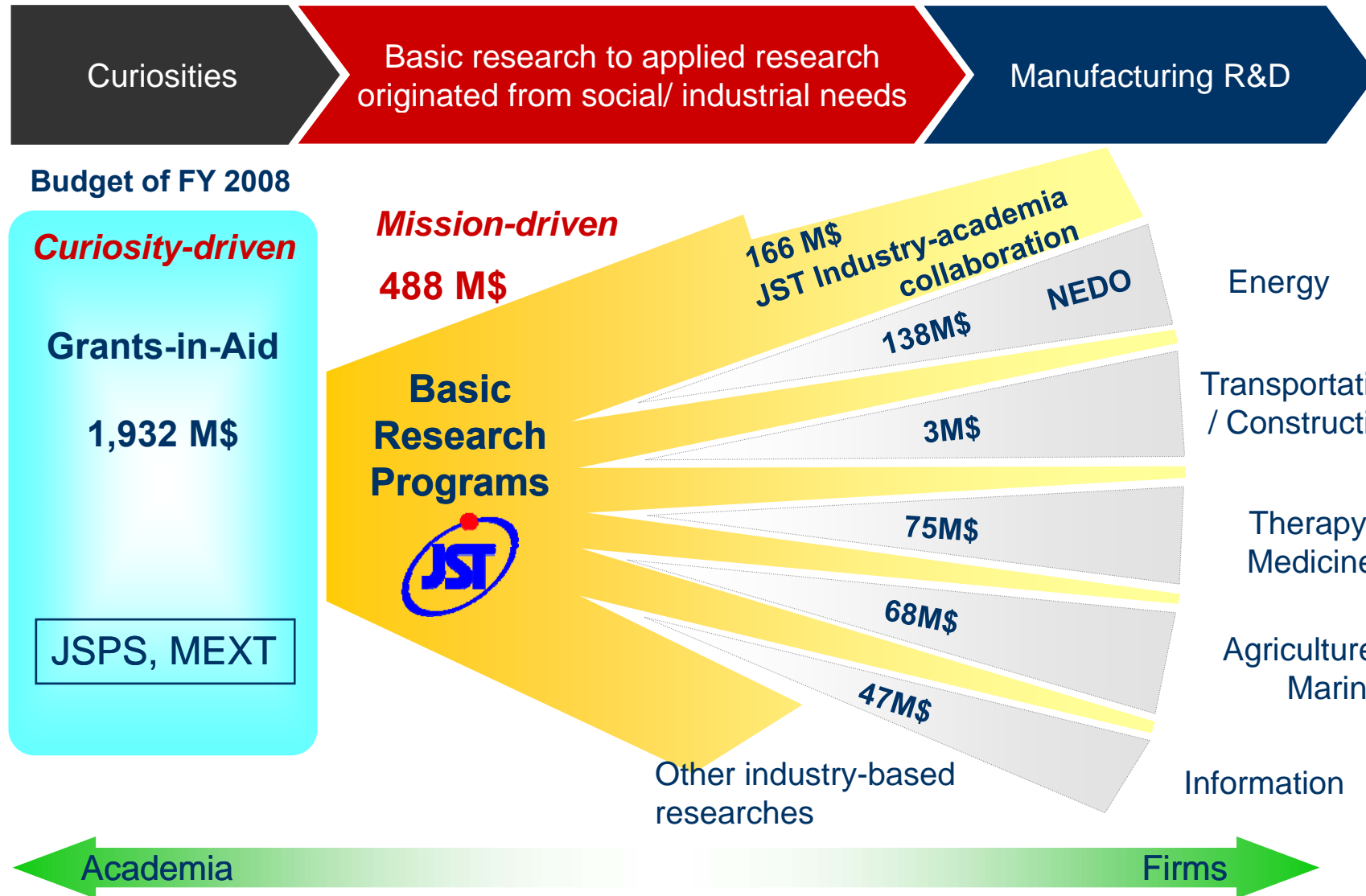
## 3. Research promotion

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# Roles of Basic Research Programs



1\$ ~100JPY

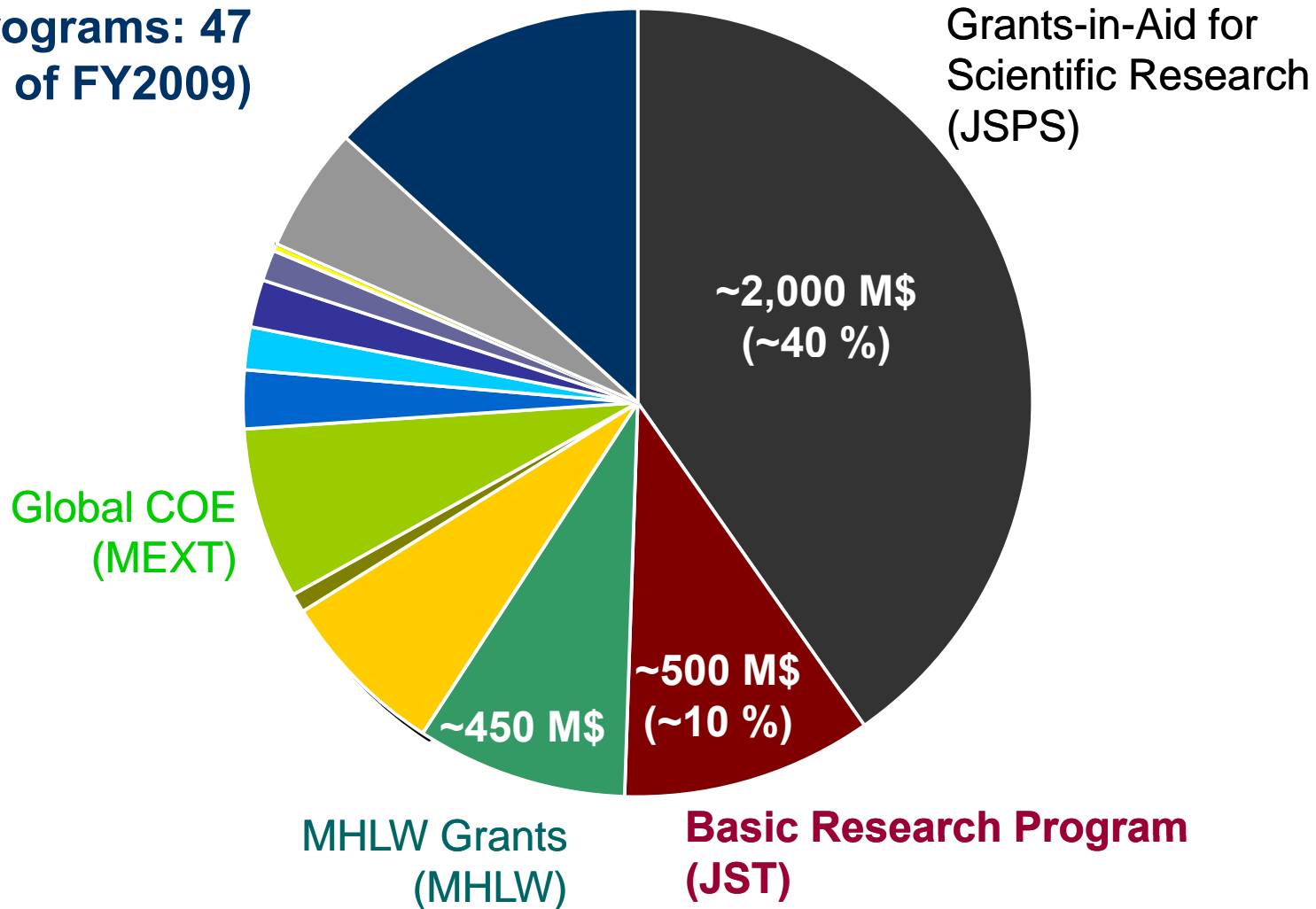


# Competitive research funding program in Japan



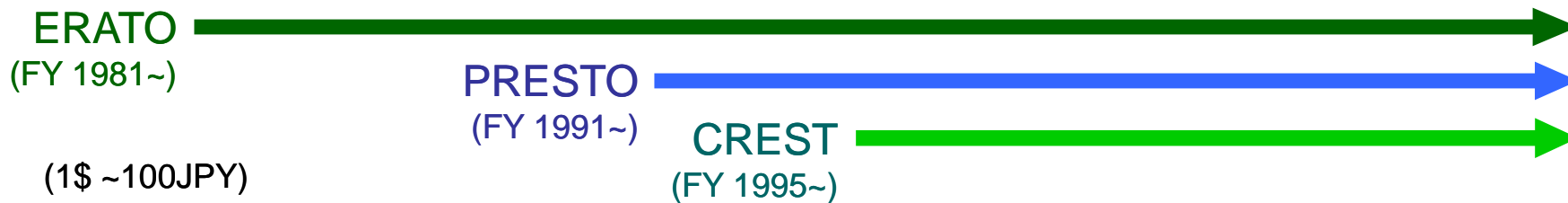
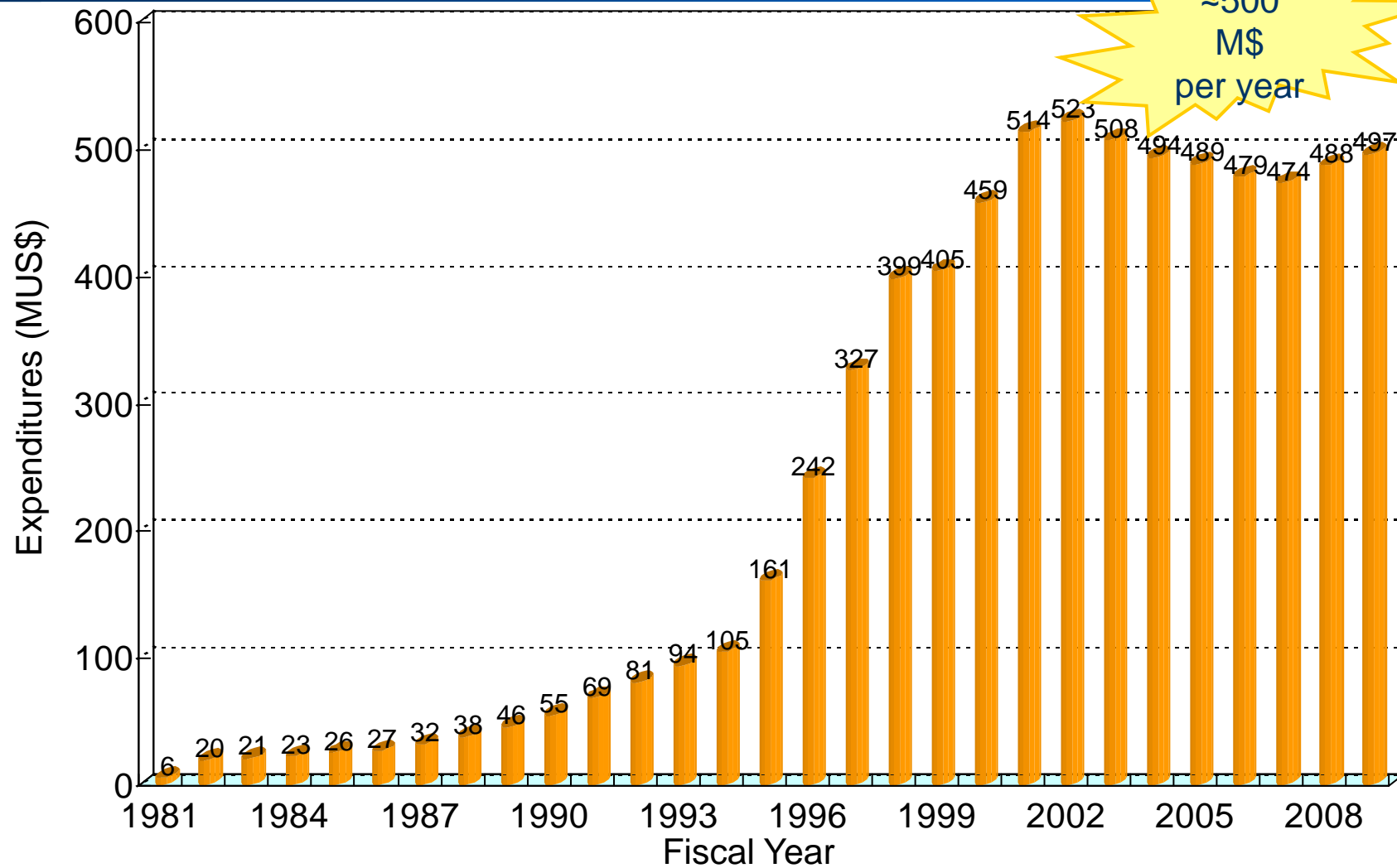
~4,900 M\$ in total

# of programs: 47  
(as of FY2009)



(1\$ ~100JPY)

# Annual budgets



# Three basic research programs



Ministry of Education, Culture, Sports, Science & Technology (MEXT)

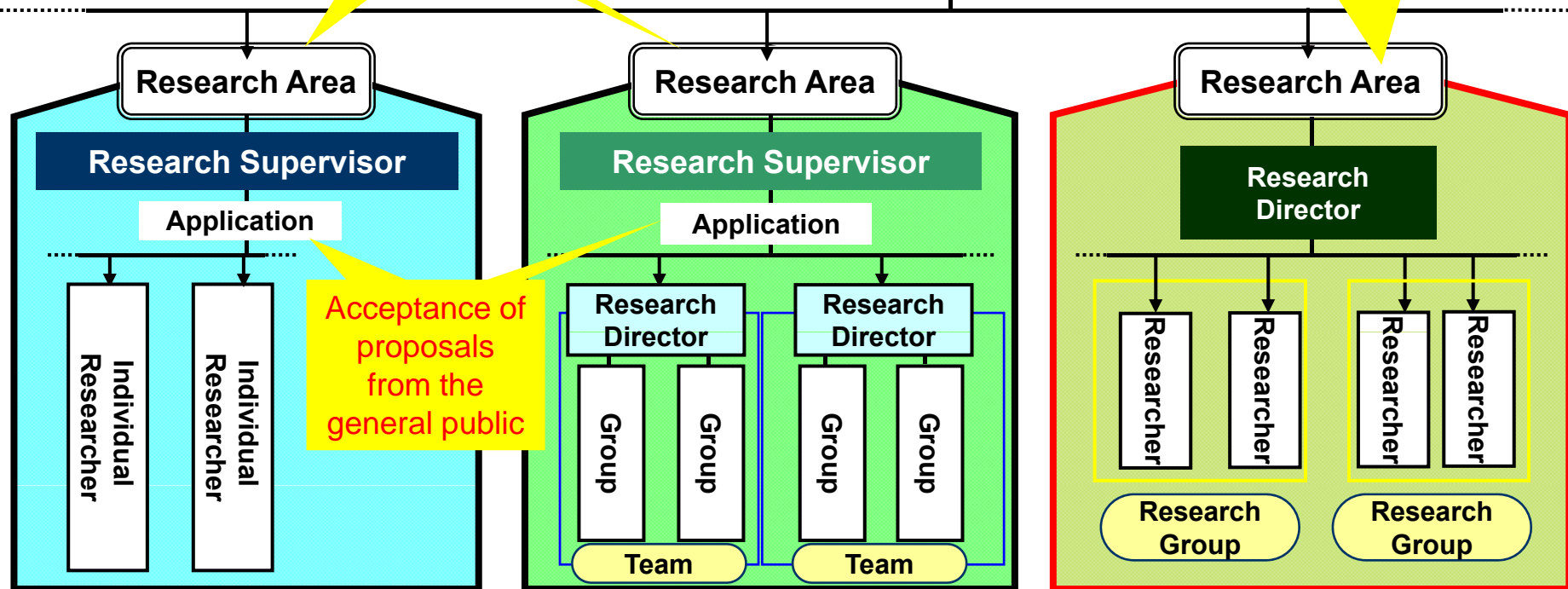
Strategic Sectors (4~5/ year)



JST

Designated by JST

Proposed by Research Director



**PRESTO**

"Individual"

(especially for young researchers)

**CREST**

"Team"

**ERATO**

"Research Director"

# Three basic research programs



Program	Type of Promotion	# of Teams/ Researchers In a Research Area	Annual Research Expenses for a Team / a Researcher	Research Period	Annual Budgets (In total)
<b>CREST (1995-)</b>	Research Supervisor & Research Teams	10~15	0.3~0.5 M\$ or 0.6~1 M\$ (w/o indirect costs)	5 yrs	about 270 M\$
<b>PRESTO (1991-)</b>	Research Supervisor & Individual Researchers	15~25	0.1~0.2 M\$ (w/o indirect costs)	3 or 5 yrs	about 90 M\$
<b>ERATO (1981-)</b>	Research Director & His/Her Organizing Research Groups	Director: 1 Gr. Leader: 3~4 Post-docs: 10~15	< 3 M\$ (w/ indirect costs)	5 yrs	about 60 M\$

(1\$ ~100JPY)



- Launch in 1981
  - Research period: ~5 years (No renewal)
  - Annual research expenses < 3 M\$ (w/ indirect costs)
- Number of projects
  - On-going: 21 (4-6 projects per year)
  - Finished : 77
  - Will be 100 in this autumn
- Reports/ Benchmarks, etc.
  - JTEC (Jpn. Tech. Evaluation Center): 1988 and 1995
  - OECD: *Steering and funding of research institutions*
  - VINNOVA: *Mapping of research financing organizations in the US, China, and Japan (2006)*
  - Domestic reports (e.g.; Hirano *et al.* 2006)
- One Nobel Laureate
  - Dr. Ryoji Noyori: Chemistry 2001 (ERATO: 1991-96)

- Is a sort of “Long-termed high-risk research”, which could
  - change the direction of thoughts in a discipline; *or*
  - make a substantial discovery to break the new ground of science and technology.
  
- Is guided by the principles of “persons” w/ innovative idea
  - His/her past accomplishments as a scientist is taken into consideration to some extent; *however*,
  - He/She should be a bold and ambitious pioneer with the potential to achieve quantum leaps.
  
- Provides new and special research opportunities
  - ERATO should never be the expansion of the on-going research.
  - Ultimate goal is to induce innovative changes not only in industries but also in economies and societies within 10-15 years.

- Roles of JST's "Basic Research Program"
- "ERATO" as a "transformative research program"

## 1. Backgrounds



- Selection of "pioneers" as ERATO Research Directors
- Unique decision-making process for avoidance of "conservative" outputs
- Nominations as the first step

## 3. Research promotion

- Roles of JST headquarters
- Dispatch of supporting staffs
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□ Is a sort of “Long-termed high-risk research”, which could

- change the direction of thought
- make a substantial contribution to the development of science and technology

**Who evaluates?**

**How is the evaluation performed?**

□ Is guided by the principles of “persons” w/ innovative idea

- His/her past accomplishments and achievements taken into consideration to some extent
- He/She should have a high potential to achieve quantitative results

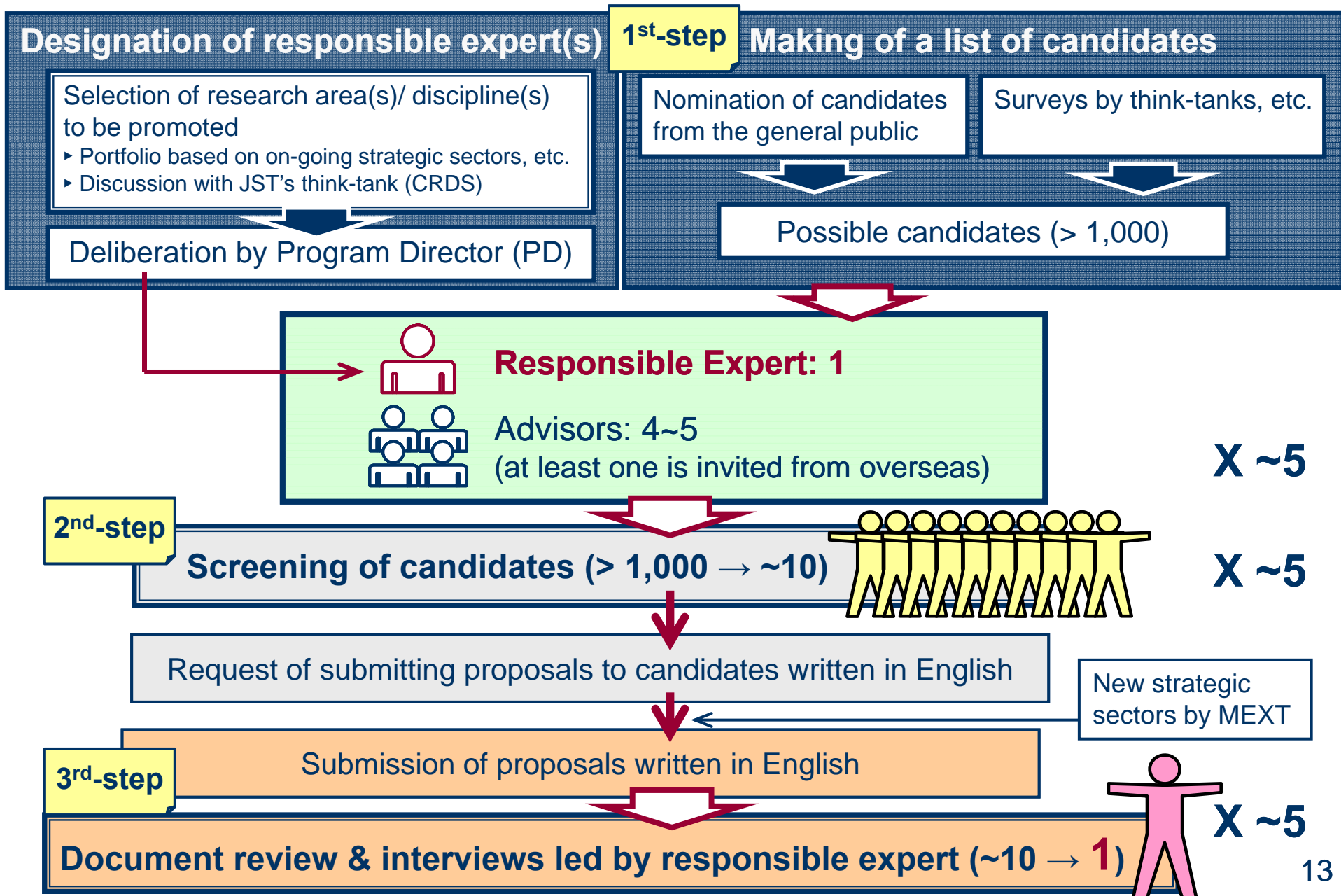
**What is the prior point?**

**How is the evaluation performed?**

□ Provides new and special research opportunities

- ERATO should never be the expansion of the on-going research.
- Ultimate goal is to induce innovative changes not only in industries but also in economies and societies within 10-15 years.

# Flow of *ex ante* evaluation in ERATO

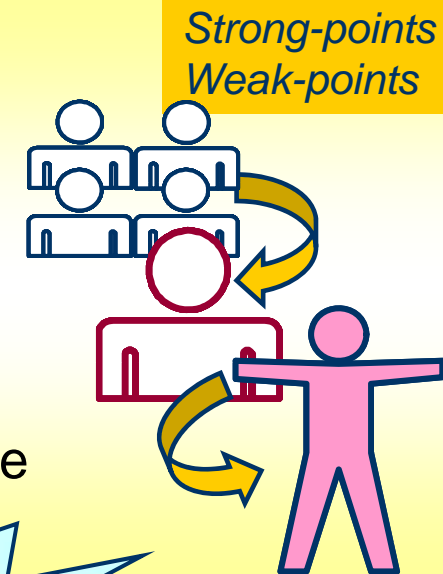


## □ Discretionary act of responsible expert

- He/She can finally select ONLY ONE candidate with his/her own decision-making.
- Advisors: comments of strong-points and weak-point on persons/proposals

## □ Role of responsible expert

- To recognize and distinguish; high potentials of the candidate, high-risk and truly innovative idea



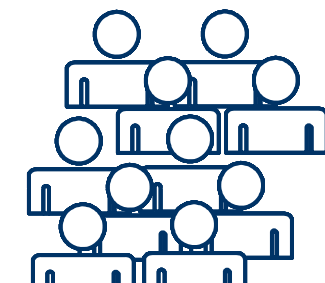
**Essential aspect**

## □ Consensual decision-making based on peer-review

- Has been adopted between 2001 and 2006.
- Is recommended not to be suitable by the International Advisory Committee (2006).

## □ 'Negative' effect of peer-review

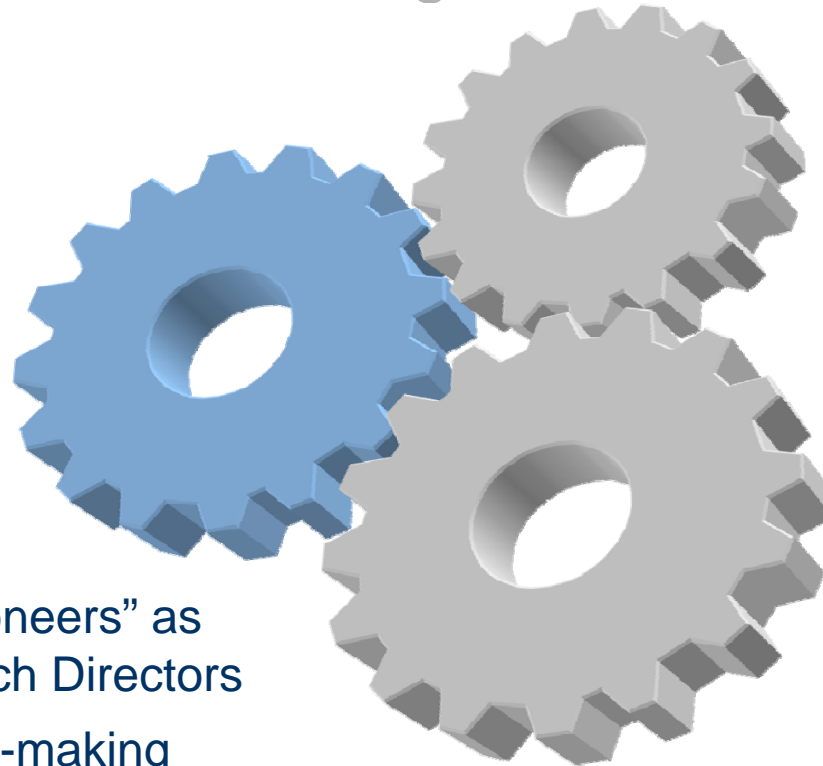
- Often has some conservative and risk-minimizing aspects (Langfeldt, *Research Evaluation* 2006)



-Same degree of responsibility  
-Controversial criticisms

- Roles of JST's "Basic Research Program"
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## □ OECD report

- Intensive surveys of the opinions of researchers in universities and industry to help **identify individuals who stand out as being strongly supported by researchers**
- 'Performers' select the 'director' with whom they would like to work

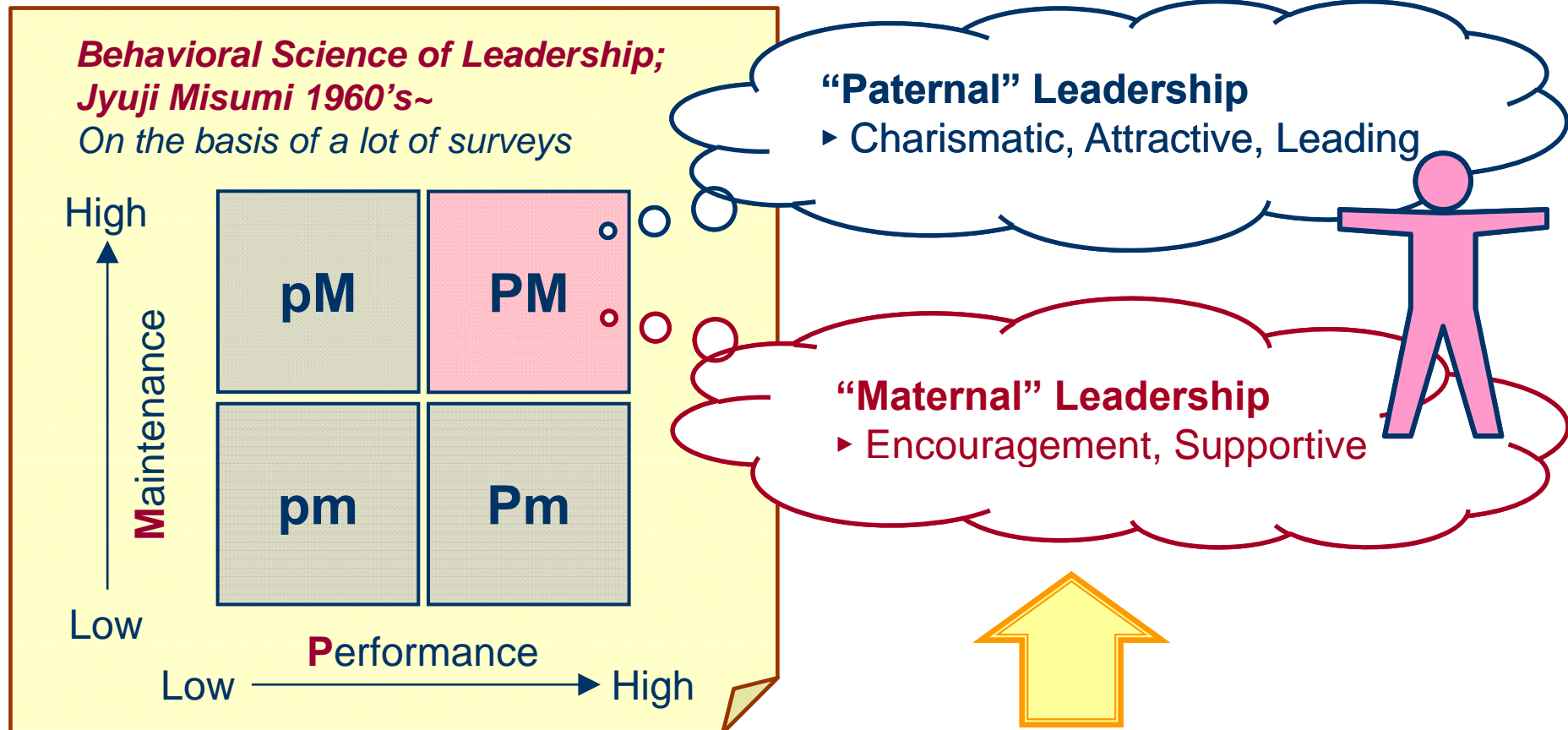
## □ Interview to the JTEC panel (by Genya Chiba)

- Two basic qualities to be looked for when scouting prospective directors: **Vision (i.e., idea) and Leadership**
- Definition of 'Leadership': charismatic and capable of attracting younger person

## □ Our experiences

- His/her own truly original philosophy/hypothesis to be developed in research opportunities like ERATO
- Although it seems to be a '*moonshine*', it is being gradually recognized as 'confidence' by proactive researchers.





## □ Starting point of *ex ante* evaluation in ERATO

- Call for nomination of candidates
- Screening of possible candidates by responsible expert before reviews of proposals

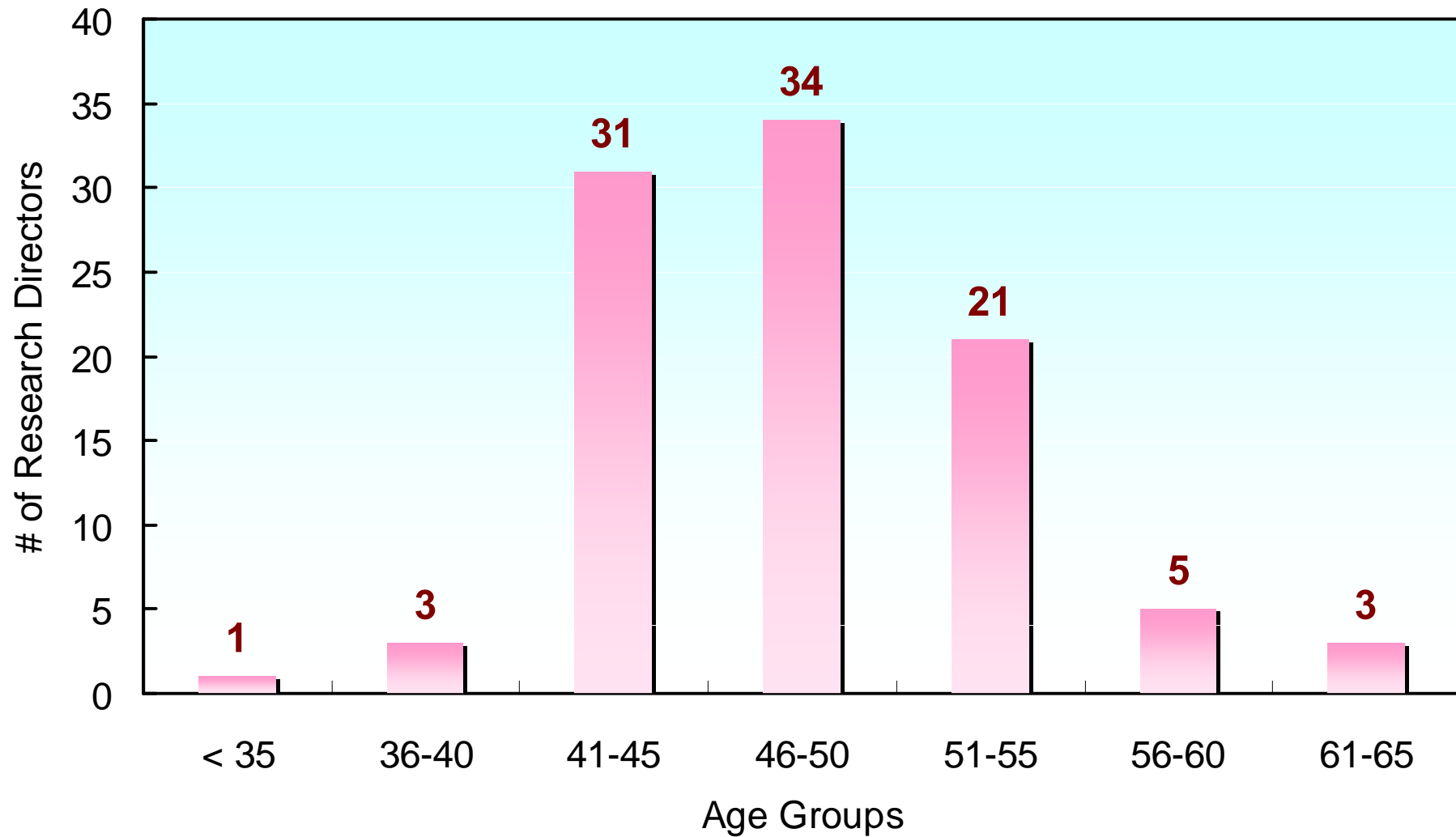
- ❑ Almost 1-year task
- ❑ No re-appointment
- ❑ Designation of his/her reliable advisors (at least one has to be invited from overseas)
- ❑ Disclosure of his/her name (w/ selection process, etc.) on the WEB when completing *ex ante* evaluation
  
- ❑ Qualifications to be desired
  - ❑ Broader expertise
  - ❑ Successful experience in leading a project like ERATO
  - ❑ Comprehension/Tolerance for a kind of high-risk research
  - ❑ Endorsement from many researchers (fairness)

- He/She can know he/she is one of the candidates of the year only when a request of proposal is given by the Responsible Expert (*via* JST).
  
- Major part of proposal is limited up to 5-7 pages, but have to be written in English.
  
- Stage of evaluation:
  - Document review / Pre-interview (domestic)
  - Full-interview (international)
  - Site-visit, if necessary
  - Refinement of proposal *via* discussions with Responsible Expert
  
- Wait for at least 1 month until final approval by Responsible Expert

# Age distribution of ERATO Research Directors



Total (1981-2008): 98  
Average: 47.958



## □ Unique decision-making process

- Avoidance of “conservative” outputs
- Discretionary act of responsible expert
- His/Her ability to recognize and distinguish high potentials of the candidate, high-risk and truly innovative idea

## □ Nominations as the first step

- Effective way to select “pioneers” as ERATO Research Directors
- Investigations by behavioral science of leadership
- Endorsements by proactive researchers

## □ Strengthening of high-risk & (high-)impact research

- Reported by Expert Panel on Basic Policy, CSTP (July 14, 2007) –  
*In Japanese*

「競争的研究資金の拡充と制度改革の推進について」

総合科学技術会議基本政策推進専門調査会

- Roles of JST's "Basic Research Program"
- "ERATO" as a "transformative research program"

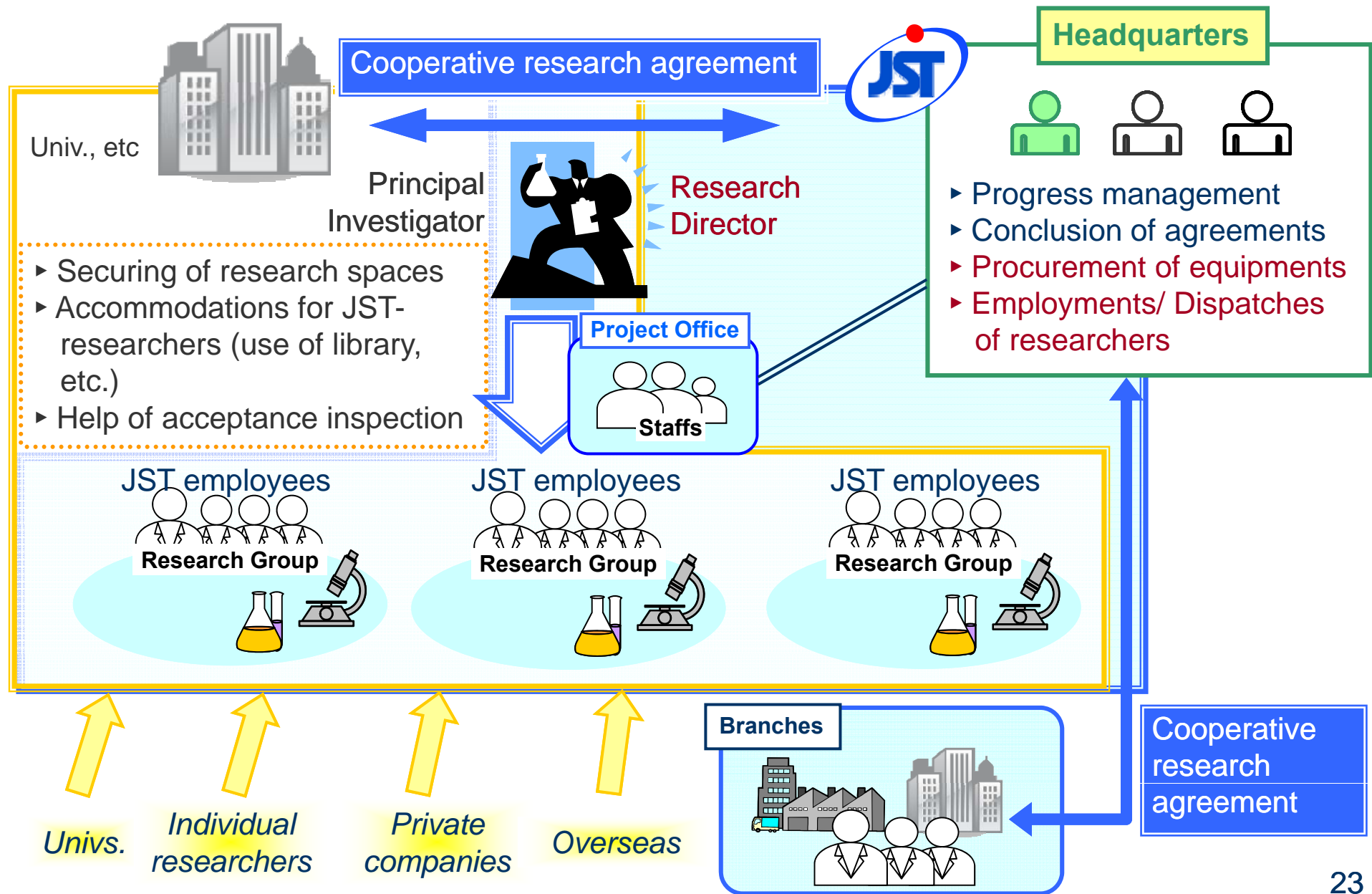
## 1. Backgrounds



## 2. *Ex ante* evaluation

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- Roles of JST headquarters
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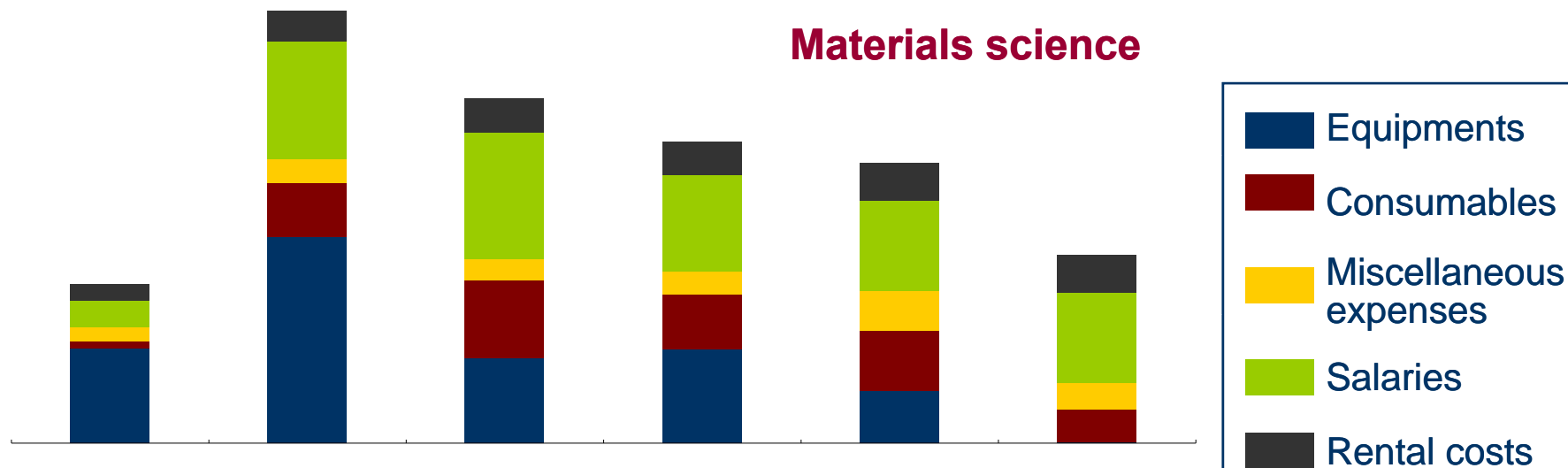
# R&D management in an ERATO project



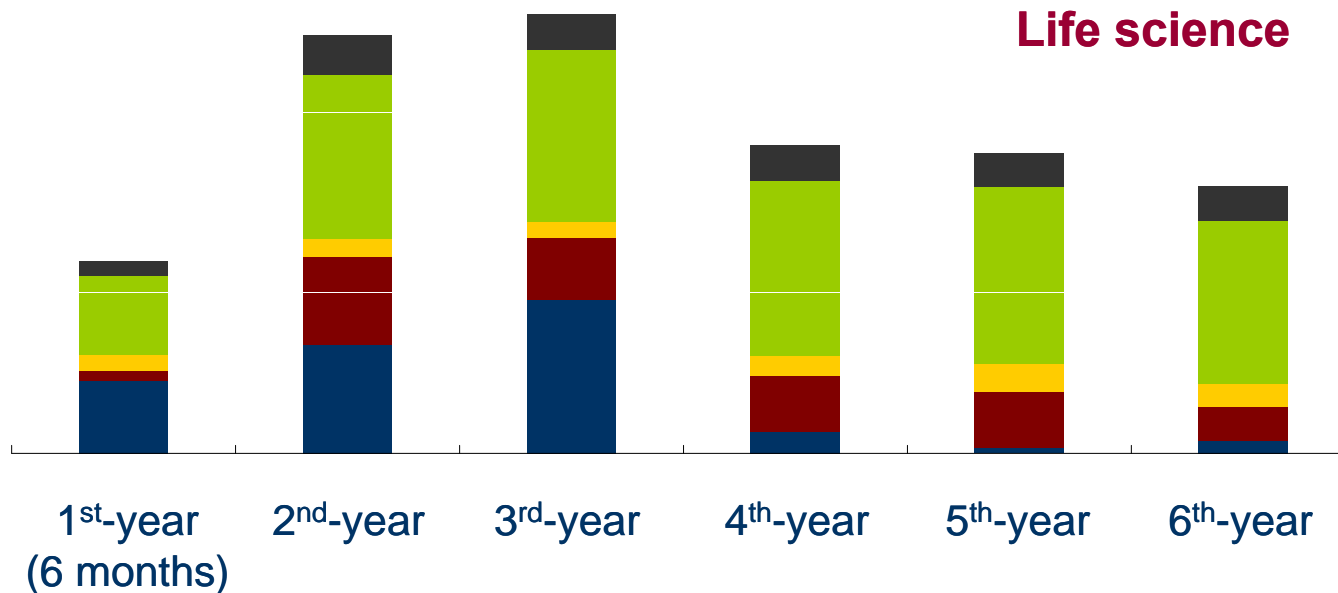
# Example of expenditure



## Materials science

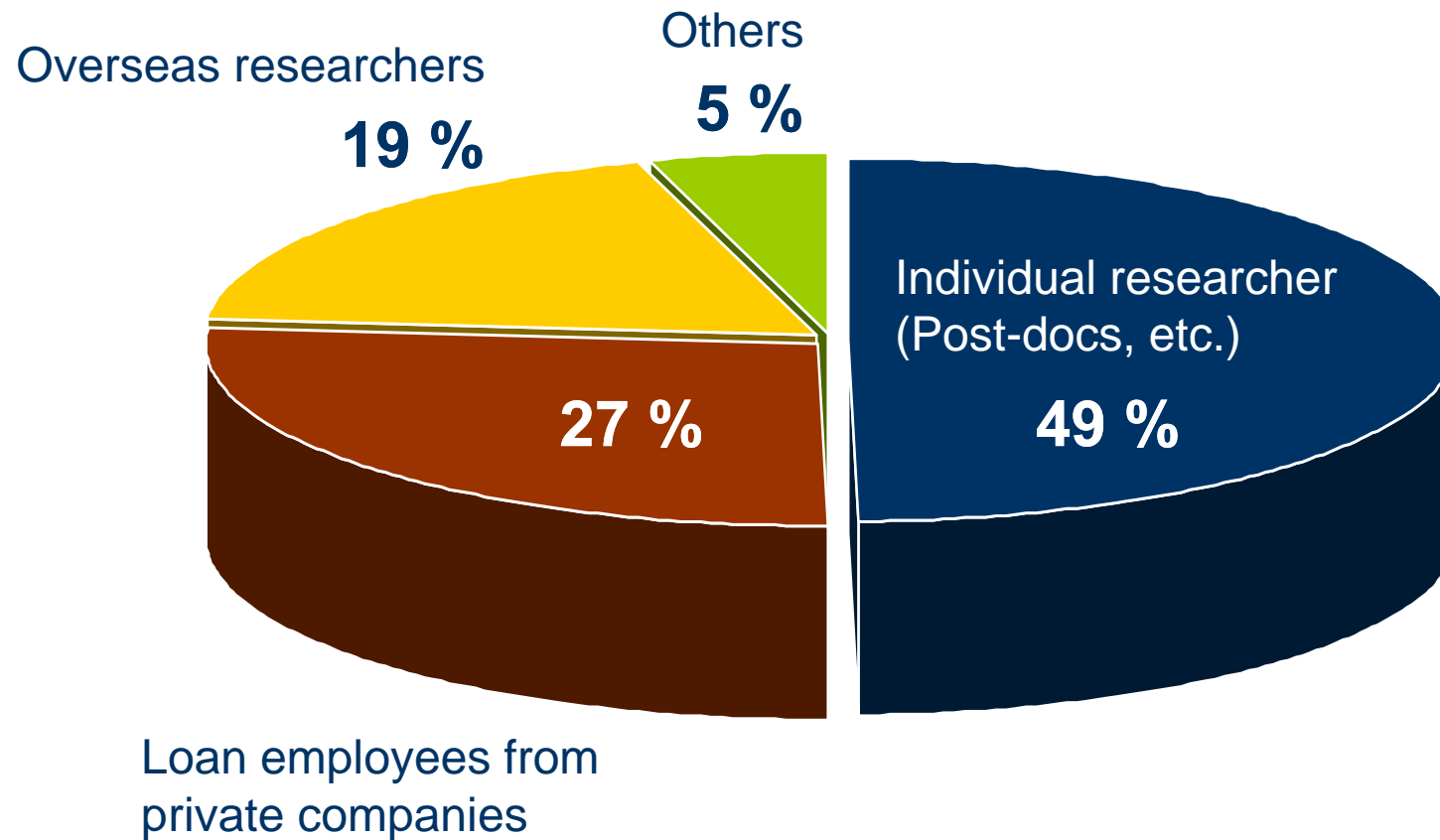


## Life science

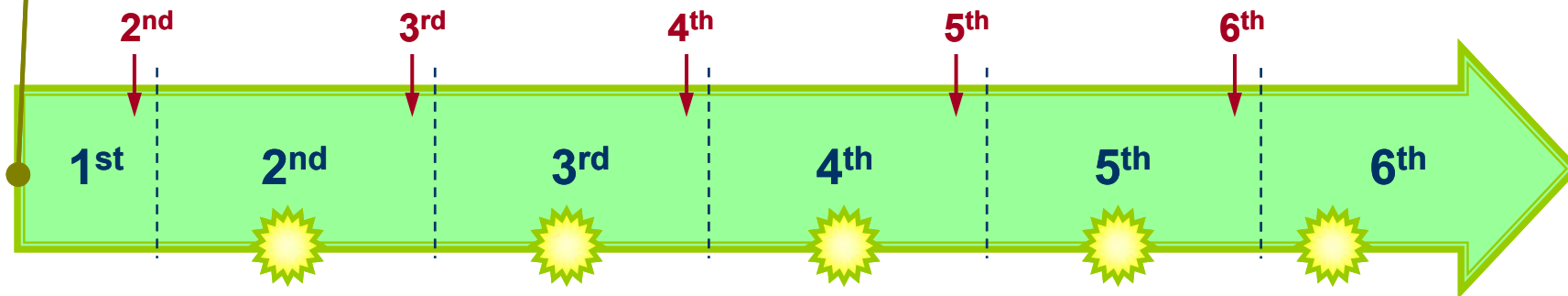




*Accumulating total  
from 1981 to 2005 Mar.*



- Budget plan for total research period (and each year)
  - 1<sup>st</sup> submission when preparing a research proposal
  - 2<sup>nd</sup> submission when being appointed as Research Director: more detailed research master plan
  - Authorization by Program Director (PD)
  
- Request of annual budget for the next FY
  - w/ Annual report of research progress
  - Authorization by Program Director (PD)



- Increase/Decrease of annual budget according to *unexpected* progress
  - Acceleration/Leverage of original research plan
  - Authorization by Program Director (PD)
  - Invitation of individual expert(s), if necessary
  - On-going project (~20)

A questionnaire about competency of other researchers

--- "How do you think of the other researchers and their research achievements?"

Period of survey: March 24 ~ April 7, 2003

1. Backgrounds

**1: "I think this research group has *pioneered a new field of science and technology.*"**

**2: "I think this researcher (research group) is one of the *world's best.*"**

**3: "I think this research group's achievements have affected the *growth of a new industrial field.*"**

**4: "I think this research group's achievements had a *spread effect for an important return to the society* (advancement of medicine, solution of social issues, etc.)"**

	Number of project	Number (ratio) of projects which more than two respondents have answered above description.	
1	53	44	(83%)
2		39	(74%)
3		24	(45%)
4		14	<del>(12%)</del> 26%

# 'FIRST' program under CSTP



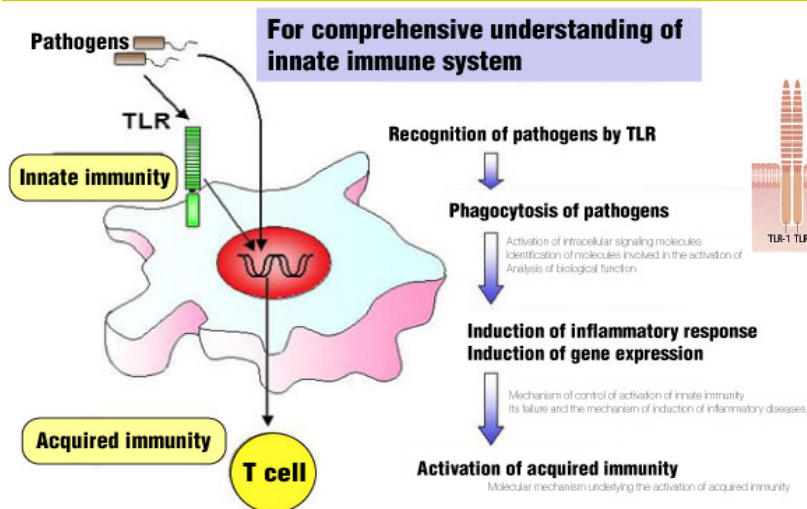
Multiple-year funds (FY 09-13); 30 ~ 150 M\$ / subject

9 out of 30 are the former or current ERATO directors (and 2 co-applicants).

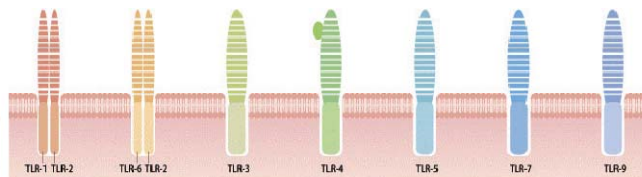
Principal Investigator	Affiliation	Research subjects	ERATO
Akira Tonomura	Hitachi; RIKEN	Electron microscopy	89-94
Yoshihisa Yamamoto	Stanford; NII	Quantum Information	93-98 (ICORP: 98-03, SORST 03-08)
Hideo Hosono	Titech	Transparent oxides & Superconductor	99-04 (SORST 04-)
Yasuhiro Koike	Keio	Plastic optical fiber	00-05 (SORST 05-)
Yoshinori Tokura	Tokyo; RIKEN	Strongly-correlated electrons	01-06; 06-
Masashi Yanagisawa	Texas; HHMI	GPCR	01-06
Hideo Ohno	Tohoku	Spintronics	02-07
Shizuo Akira	Osaka	Immunology	02-07
Kazuyuki Aihara	Tokyo	Mathematics	03-08

*Funding Program for World-Leading Innovative R&D on Science and Technology (FIRST)*

## Elucidation of functions of Toll-like receptors (TLRs) for innate immunity



### TLR family



**Prof. Shizuo Akira**  
Osaka Univ.

CREST: FY1996-2001  
ERATO: FY2002-2007

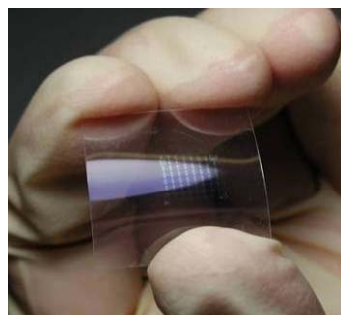
▶ “The Hottest Researcher”  
(by Thomson)

## Exploration of new materials (transparent semiconductor, superconductor, etc.)



**Prof. Hideo Hosono**  
Tokyo Institute of Tech.

ERATO: FY1999-2004  
SORST: FY2004-2009



### High-mobility TFT on PET films

- ▶ Transparent amorphous oxide semiconductor (TAOS)
- ▶ JPN: Canon, Toppan, Sharp ▶ KOR: Samsung, LG

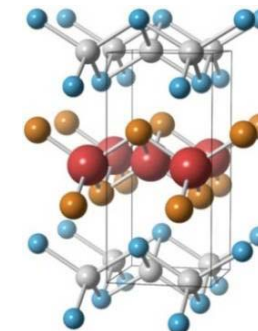
Nature 2004

JACS 2008



### New family of high-temperature superconductor

- ▶ Iron-based layered compounds
- ▶ Most cited papers in 2008 (by Thomson-Reuters)



- ERATO as a “transformative research program”
  - **10-15 M\$ / 5 years:** change the direction of thoughts in a discipline; or make a substantial discovery to break the new ground of science and technology
  - **Ex ante evaluation:** unique decision-making process, nomination as the first step
  - **Research promotion:** JST Headquarters (and supporting staffs), flexible funding according to the progress
  
- Generation of world-leading scientists and research outputs
  
- **Continuative efforts to explore future leaders and his/her innovative (transformative) ideas**

# Call for nomination (Open now)



## Press Release

戦略的創造研究推進事業「総括実施型研究 (ERATO型研究)」における  
平成22年度研究総括候補の推薦の募集について

JST(理事長 北澤 宏一)は、戦略的創造研究推進事業「総括実施型研究(ERATO型研究)」において、平成22年度新規の研究総括候補の推薦募集を平成21年8月18日(火)から10月30日(金)午後5時までの期間で行います。

ERATO型研究とは、基礎研究から今後の科学技術の源流となる斬新しい思想を生み出すなかで、科学技術の芽を積極的に生み出すことを目的としています。平成22年度の研究総括および研究領域の選定では、JST独自の調査による候補者リスト収集に加えて、国立研究機関、大学、民間研究機関などに所属する方に広く研究総括候補者を推薦(募集)していただき、選考対象とします。

募集の詳細については、[別紙資料](#)を参照してください。さらに、下記の募集ホームページでも関係情報を掲載しますので併せてご覧ください。

ホームページURL:<http://www.jst.go.jp/erato/boshu10/>

< 添付資料 >

別紙:戦略的創造研究推進事業「総括実施型研究(ERATO型研究)」の推薦募集 概要

< お問い合わせ先 >

独立行政法人 科学技術振興機構 インベーション推進本部 研究プロジェクト推進部  
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[www.adm9708.yjst.go.jp](http://www.adm9708.yjst.go.jp)

<http://www.jst.go.jp/pr/info/info663/index.html>

戦略的創造研究推進事業(ERATO型研究)における  
研究総括候補の推薦(応募)の募集について

# ERATO

平成22年度戦略的創造研究推進事業(ERATO型研究)における  
研究総括候補の推薦(応募)の募集について

### I 概要

当競争では、社会・経済の変革につながるイノベーションを誘起するシステムの一環として、国の政策を踏んで戦略的に重点化した分野における目的基礎研究を推進。今後の科学技術の発展や新産業の創出につながる革新的な新技術を開発することを目的として、戦略的創造研究推進事業を実施しています。戦略的創造研究推進事業(ERATO型研究)では、卓越した洞察力と指導力をもった、研究領域についての独特な見識を備えている研究総括が、リーダーとして研究プロジェクトを構成し、組織の枠を超えた研究員の参加を求め、研究を指揮します。新しい科学技術の源流を作るのに相応しい、将来の科学技術にとって重要なものになるような研究を実施します。

今回、ERATO型研究の選考において、一次候補者母集団を形成する優れた研究総括候補の推薦(応募)を募集いたします。

### II 事業の概要

- 1 研究の種類  
革新的な科学技術の芽あるいは将来の斬新しい流れを生み出す研究。  
※既存の研究の延長線上や大規模化ではない、新たな視点を感じ込んだ挑戦的なもの  
※10~15年後に新たな科学技術分野への展開や、新産業の創出が期待できるもの
- 2 仕組み  
研究総括と、組織を超えた研究員の参加による人を中心とした時限プロジェクト制。研究総括は、プロジェクトの運営を司る監督官に当たります。研究の構想と計画づくり、構成員の選定、研究の指揮、プロジェクト予算の調整など研究の基本事項は研究総括の意見に沿って決められます。また、挑戦的、抜本的な研究を行うために、組織や専門分野を超えて集まった優秀な研究員を結集し、研究を実施していきます。

<http://www.jst.go.jp/erato/boshu10/index.html>

Application period:

August 18, 2009 ~ **October 30, 2009 (Fri.)**

Mail to: **erato10@jst.go.jp**

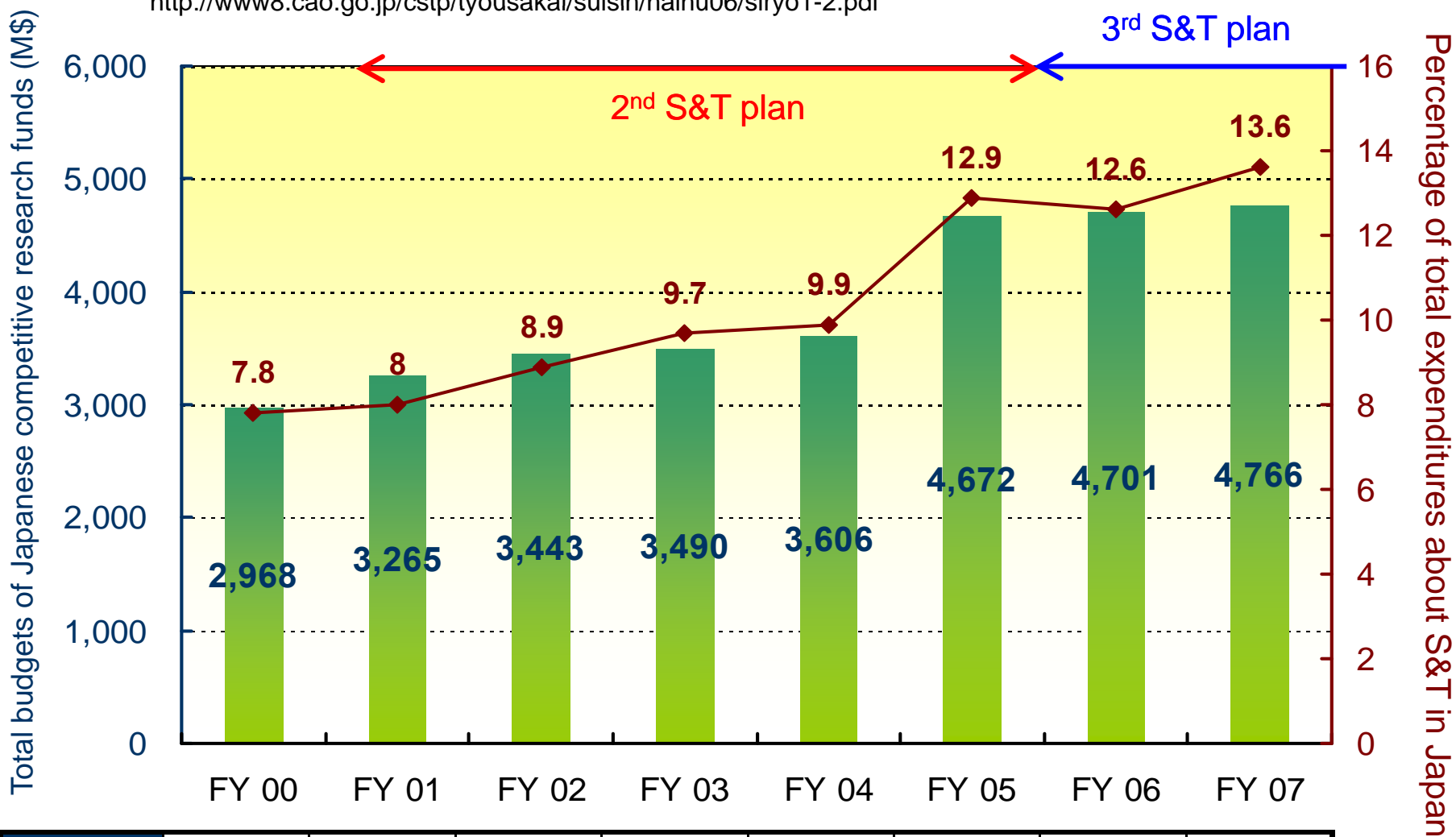
# Appendix



# Transition of Japanese competitive research funds



<http://www8.cao.go.jp/cstp/tyousakai/suisin/haihu06/siryo1-2.pdf>



Ministries	7	7	7	7	7	8	8	8
Programs	22	25	23	26	28	37	36	37

# Differences in *ex ante* evaluations

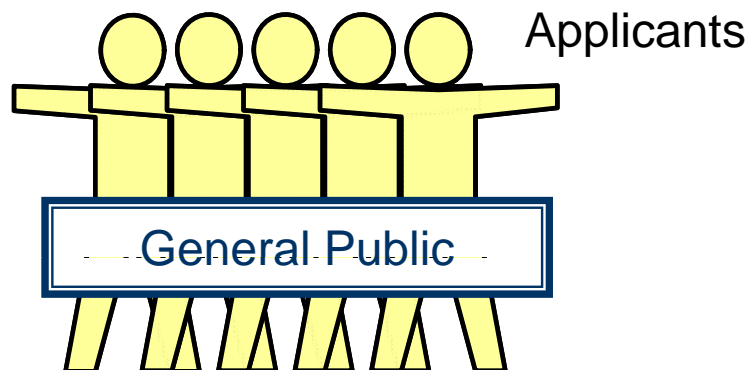
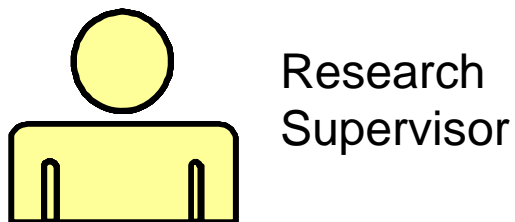


	PRESTO	CREST	ERATO
MEXT	Strategic Sector to JST		
JST	Designation of <input type="checkbox"/> Research Area <input type="checkbox"/> Research Supervisor ; a kind of Project Manager (PM)		Designation of <input type="checkbox"/> Responsible Expert ; Responsible Person in <i>ex ante</i> Evaluation
Person(s) to be selected	Individual Researcher	Research Director	Research Director
<i>Ex ante</i> Evaluation	<b>Bottom-up system</b> 1. Submission of Research Proposal to Research Supervisor by Applicants 2. Document Review and Interview by Research Supervisor		<b>Top-down system</b> 1. Screening of Candidates (> 1,000) 2. 50 possible candidates 3. Submission of Research Proposals 4. Document Review and Interview

# Bottom-up vs. Top-down



**CREST & PRESTO**  
; Bottom-up Process



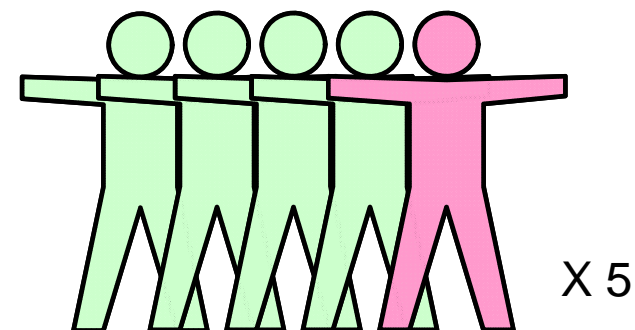
**ERATO**  
; Top-down Process



*Request of Submission of Proposals*

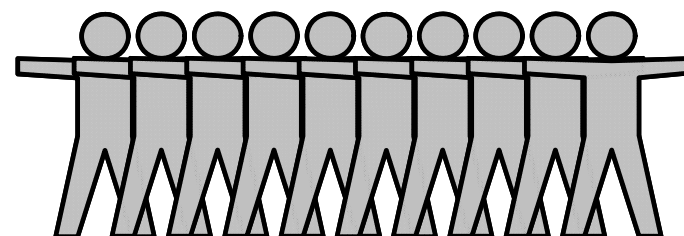


Candidates  
(#: ca. 10)



> 1,000

*Nomination of candidates*



General Public

# History of *ex ante* evaluation in ERATO

