



Research as a Career

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Being a Professional Researcher

- ◆ My research career so far
 - Graduate student (Berkeley, 5 years)
 - University professor (UIUC, 11 years)
 - Industrial researcher (MSRA, 5 years)
 - Chinese university professor (ShanghaiTech, 0.33 years)
- ◆ Research as a career
 - Reasons
 - Mentality
 - Measure of success
 - Methods
- ◆ Why ShanghaiTech?



Reasons: know your purpose





Reasons: Good or Bad

◆ Bad reasons:

- Natural choice for a good student (Tsinghua -> Berkeley) ?
- A respectful job to earn a living (Berkeley -> UIUC) ?
- To make money (UIUC -> MSRA) ?
- To make a name (MSRA -> ShanghaiTech) ?

◆ Good reasons:

- Have passion for deeper and more knowledge (study/research)
- Enjoy challenging yourself intellectually (new jobs/topics)
- Enjoy enlightening and empowering others (education)



Reasons

一等人工作即爱好，
二等人工作为爱好，
三等人工作无爱好，
四等人无工作爱好。

末等人：不爱好研究的研究员！

Research is not a profession, it is first a hobby!



Mentality: it could be the most painful job in the world!

- Competing with the smartest people in the whole world
- High chance of failure and slim chance of success
- Not so flattering public image (blame Hollywood)
- Unlimited and irregular working hours
- Limited if not the worst salary
(except China has **the worst but unlimited** salary)



Mentality: it is only for the psychologically strong

- ◆ An endless cycle between excitement and depression...
- ◆ An endless cycle between sense of success and failure...
- ◆ An endless cycle between over-confidence and self-doubt...

Research needs **faith** in there are always interesting new things for you to discover!



Mentality: wrong ideas about research

- ◆ You think research is only for genius.
- ◆ You need to know everything about the subject in advance.
- ◆ You are a genius yourself.
- ◆ You only want to work on the most important problem.

Research is for anyone who has passion and determination.



Mentality: the right attitudes

- ◆ Be both confident and humble (about your own work)
- ◆ Be both critical and appreciative (about other's work)
- ◆ Be both ambitious and realistic (about your research plan)
- ◆ Be both aggressive and generous (about credits)



Measure of success is all about people!

- ◆ Who is your role model (模范标准)
- ◆ Who is in your field (同行水平)
- ◆ Who you work with (同事素质)
- ◆ Who work or worked for you (学生、下属成就)
- ◆ Who you have influenced (粉丝、用户、大众影响)

Life is successful only if you can earn respect from people you respect, not envy from people you envy.

事业的成功在于从你所尊敬的人那里赢得尊敬，而不是从你所嫉妒的人那里获取嫉妒。



Measure: for success in academia

- ◆ **International Community Peer Respect**
 - Promotions (Tenure, Full Professor, Chair Professor etc.)
 - Society (IEEE or ACM) Awards and Fellows
 - Top Conference or Journal Leadership and Distinctions
- ◆ **Peer Evaluation Based On:**
 - Most Influential Research Results (Top papers -- the older you are, the less!)
 - Education (Students, new courses, new books etc.)

The best research results are knowledge worth passing on to future generations! (文章千古事!)



Measure: for success in industrial research lab

- ◆ Community or Industrial Peer Respect
 - Most Influential Research Results (Highly cited papers or patents)
 - Society (IEEE or ACM) Awards and Fellows
 - Top Conference or Journal Leadership and Distinctions
- ◆ Internal Evaluation Based On:
 - Contributions to existing products
 - Growth (new inventions, new products, new businesses, new teams, etc.)

The best contributions are technologies that help the company or the entire industry to grow! (发展才是硬道理!)



Measure: of peer respect

	Assistant professor	Associate professor	Full professor	Society Fellows	Lifetime Honors
Papers	2-3	3-5	5	1-2	1
References	3-5	10-12	8-10	8	5-6
Conference Chairs		> 1	2-3	2-3	
Journal Editors		> 1	1-2	2-3	
Keynote Speeches			> 1		

Number does not matter, quality does!



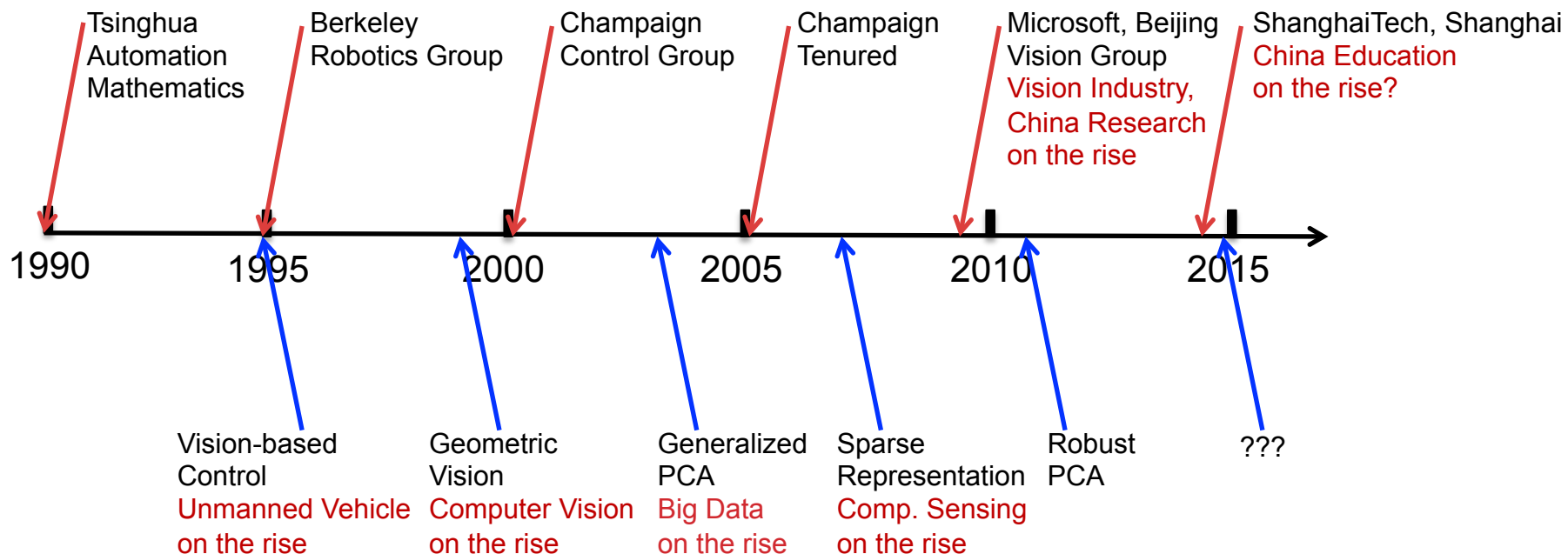
Measure: in the eyes of peers

- ◆ **Solid**: your work is average in your age group
- ◆ **Excellent**: your work is among the best in your age group
- ◆ **Outstanding**: your work clearly exceeds that of your age group
- ◆ **Phenomenal**: your work exceeds all age groups
- ◆ **Ground-breaking**: your work breaks some barriers of the field
- ◆ **Revolutionary**: your work breaks the boundaries of the field



Method: be strategic about choosing your jobs

- ◆ Which field and which place you can maximize your value?
- ◆ Whether you can improve yourself and learn new things?





Method: be systematic

	Multiple-view Geometry 1998-2004	Generalized PCA 2003-2008	Sparse Representation 2007-2013
Journal papers	12	12	> 15
Conference papers	> 20	> 15	> 30
Textbooks	1 (5 years)	1 (10 years)	1 (? years)
International tutorials/ workshops	11	5	9



Method: to develop good taste

- ◆ Engineering is about optimization, but engineering research is not!
Research is to find the limit and better ways of optimization.
- ◆ Engineering is about innovation, but engineering research is not!
Research is to explain why an innovation works.
- ◆ Engineering science is either science nor empirical science!
It is more like applied mathematics and applied science.

Research is all about generalizability, whereas engineering is about instantiation and implementation.



Method: what is a good research result?

- ◆ **Novelty** (better if you were not able to publish it at first)
- ◆ **Simplicity** (better if your advisor refused to grant you a degree)
- ◆ **Universality** (better if others found it trivial at first sight)

Enlightening research results are like love at first sight, keep you up all night! (新发现如初恋，让你彻夜难眠！)



Method: warning signs of bogus research

1. Prove by successful instances
2. Compound and conquer
3. Results too complicated to reproduce
4. Reinvent the wheel without proper acknowledgment
5. Tackle ill-posed problems directly
6. Solicit popularity over expert opinions
7. Ocam's razor reversed
8. Monkey collects corn cobs

Warning signs of bogus research, Yi Ma, 2007.



Method: protect your reputation and scholarship!

Adequate references

Protect copyright

Retract false results

Share ideas & credits

Fair competition

... ..

Selective reference
(蒙混评审)

Double submission
(一稿多投)

Cherry-pick results
(筛选结果)

Borrow ideas steal credits
(打时间差)

Unfair comparison
(不公平对比)

... ..

Plagiarism

Self plagiarism

Fabricating results

Steal ideas

Sabotage others

... ..

The only person you could cheat is yourself! (自欺不欺人!)



Method: how to manage talent?

- ◆ What you get is what you reward.
- ◆ Businessmen value numbers; politicians value credits; academicians value potentials.
- ◆ Reward good behaviors and good taste.
- ◆ The last thing to manage talent is based only on results!

All top talents are free agents.

士为知己者死，才为用人者生。

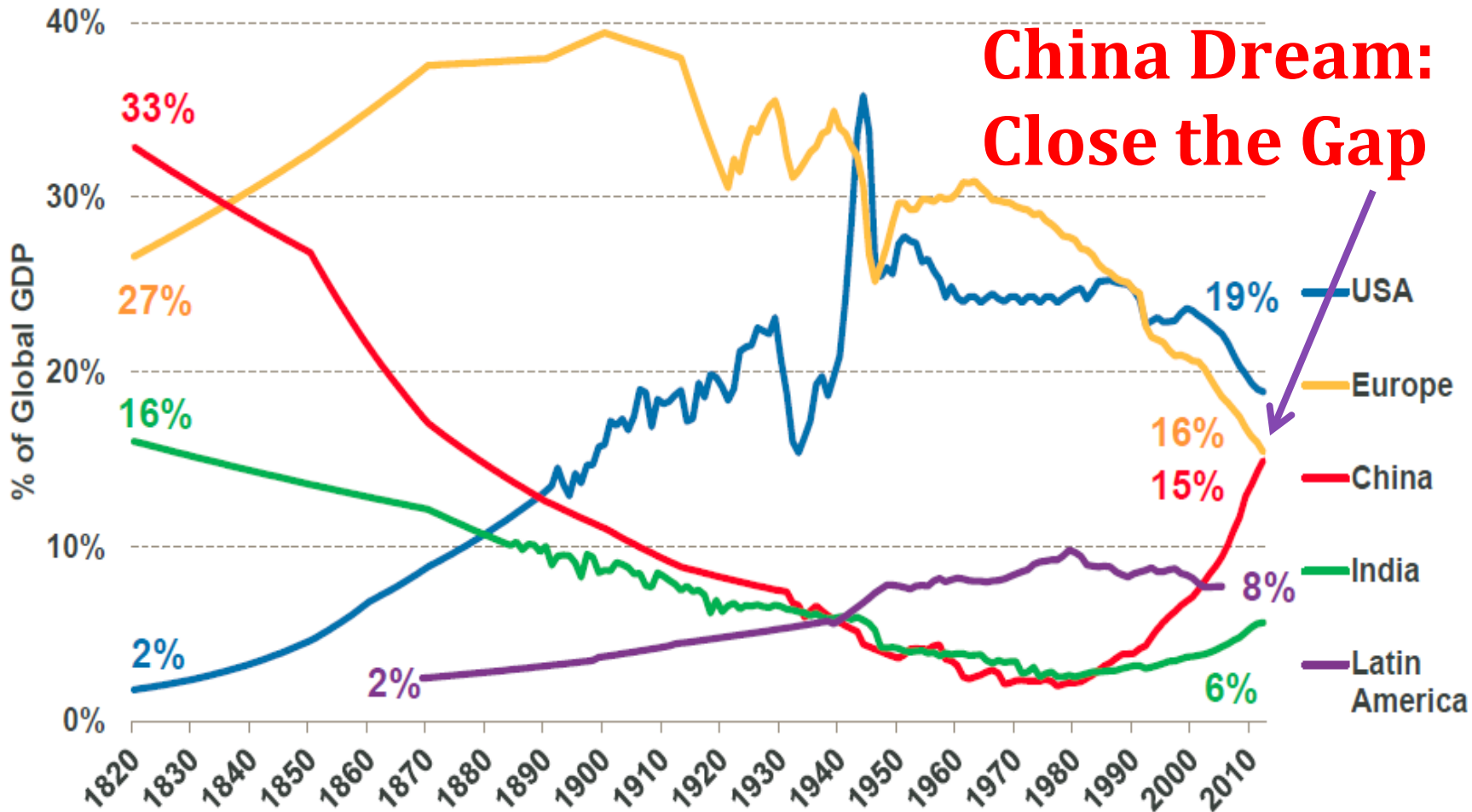


Why research so important for China now?

Why ShanghaiTech University?



Percent of Global GDP, 1820 – 2012,
USA vs. Europe vs. China vs. India vs. Latin America



Source: KPSB Internet Trends Report, Mary Meeker/Liang Wu, 5/23/2013



Roadmap of China's modernization

Urbanization



Land, Jobs

Industrialization



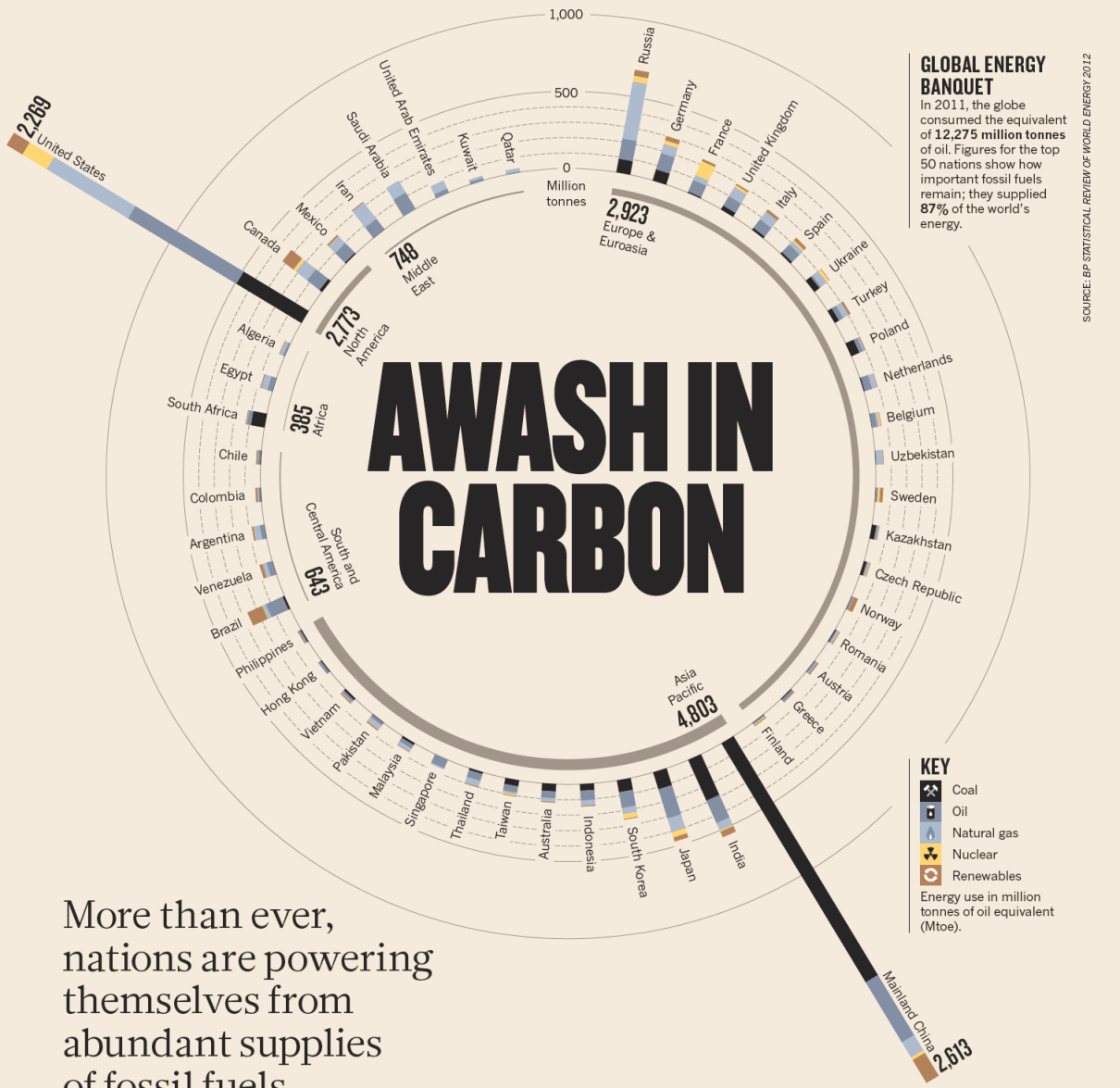
Energy, Raw
Material
Environment

Informatization



Proprietary
Technology

Resource Scarcity!



SOURCE: BP STATISTICAL REVIEW OF WORLD ENERGY 2012

Two largest consumers of fossil fuels

China: ~70% Coal

USA: ~70% Oil&Gas

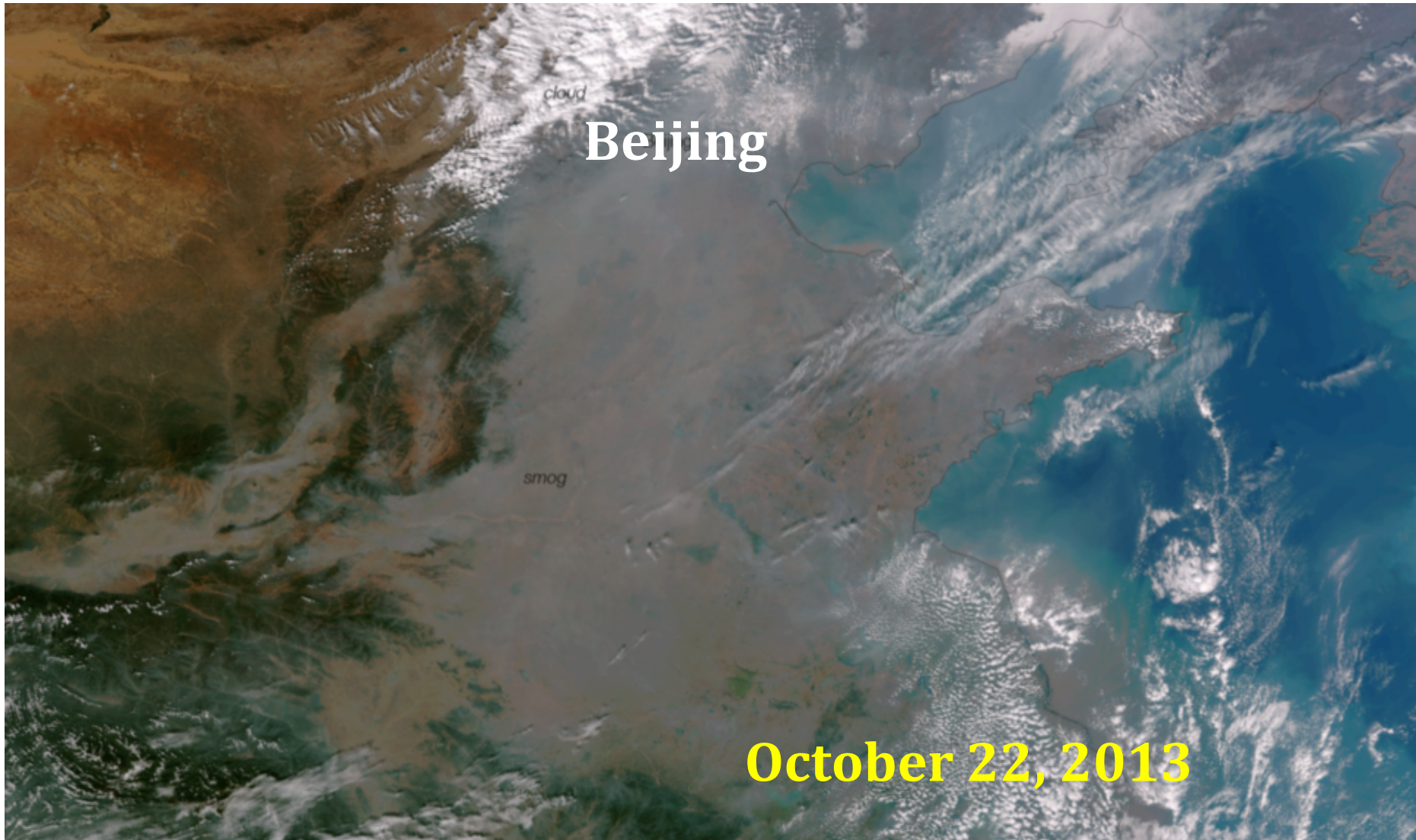
Source: Nature 491, 654-655, November 29, 2012)

More than ever, nations are powering themselves from abundant supplies of fossil fuels.



Sky has changed

Photo from NASA Satellite



Beijing

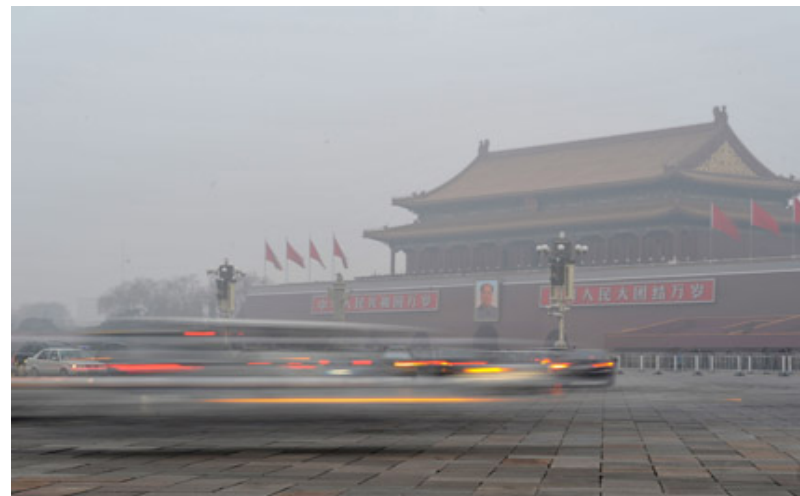
October 22, 2013



Really changed...

Yesterday

Today





History repeats...

Photos from Internet



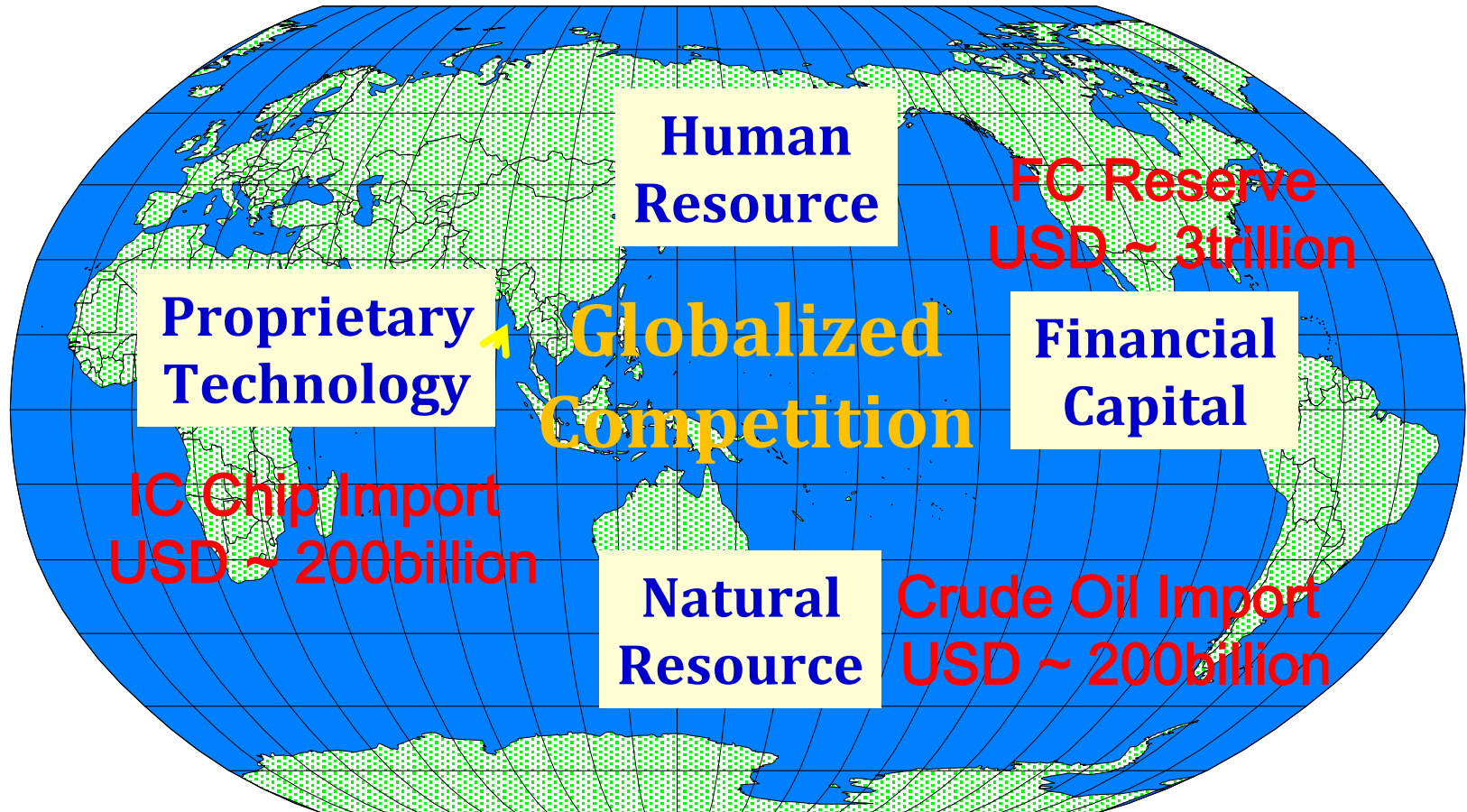
London, 1953



Beijing, 2013



Resource Allocation



China's Comparative Advantage?



Middle-income Trap

Losing competitiveness in labor-intensive resource-intensive industries but failing to gain new resources of growth from innovation!





Reality

Education

Innovation

**260m Migrant workers
In the past 30 years**



Dream

Photos from the Internet



Challenge of China's Higher Education



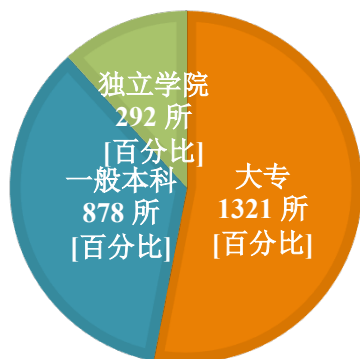
Photos from Internet



中美高校数量

中国高校数量（总计2491所）

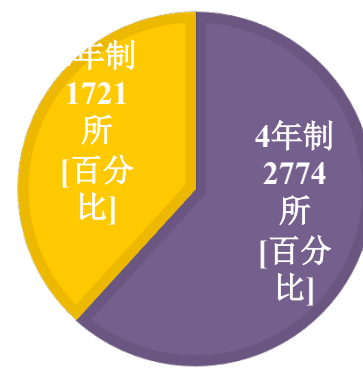
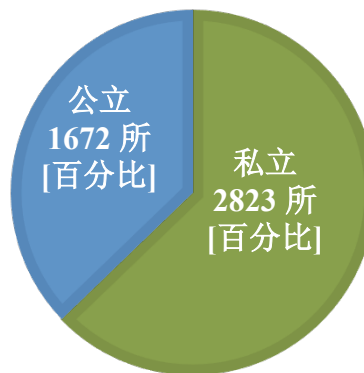
■ 专科院校 ■ 一般本科高校 ■ 独立学院



美国高校数量（总计4495所）

■ 私立 ■ 公立

■ 4年制 ■ 2年制

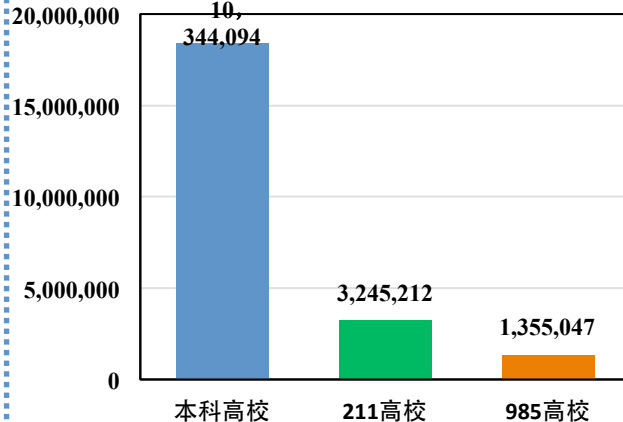
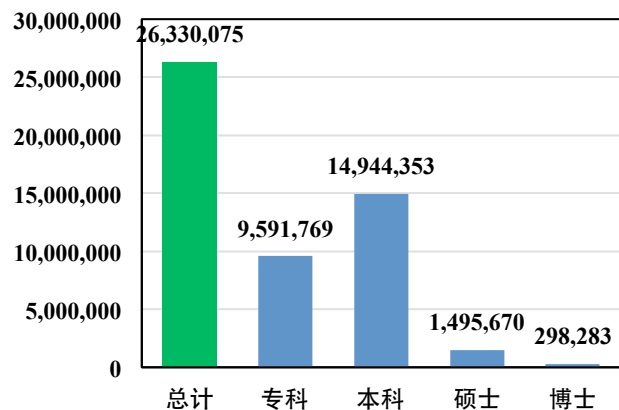


- ◆ 中国高校数量为 **2491** 所，其中一般本科 **878** 所。
“211”高校 **110** 所，“985”高校 **39** 所。
- ◆ 美国高校数量为 **4495** 所，其中 2 年制为 **1721** 所，4 年制为 **2774** 所。
私立为 **2823** 所，公立为 **1672** 所。



中美高校全日制在校人数 (2013)

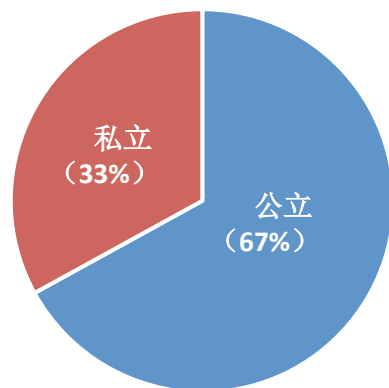
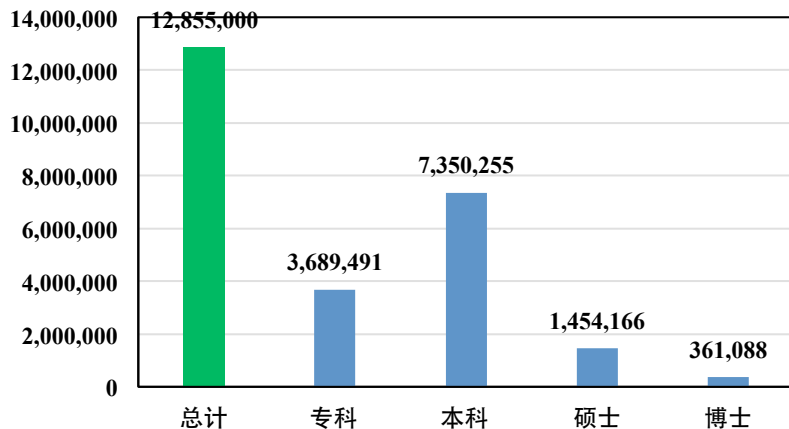
中国高校全日制在校人数 (总计26,330,075)



- ◆ 中国高校
总计 26,330,075;
“211”为 3,245,212;
“985”为 1,355,047。

- ◆ 美国高校
总计 12,855,000 ;
私立占33% ;
公立占67%。

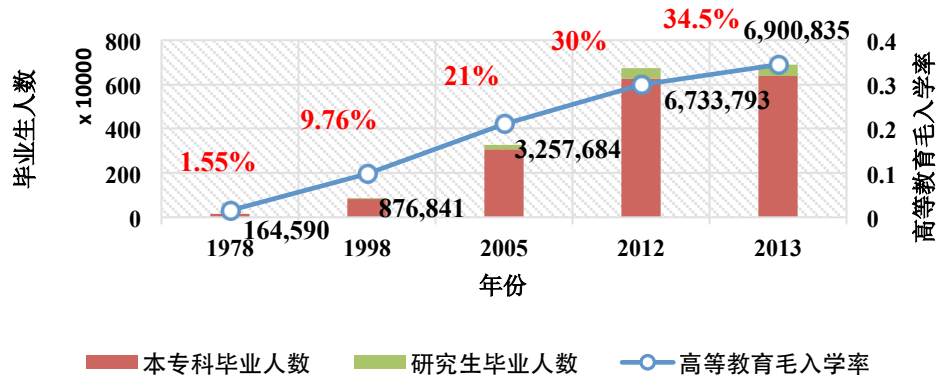
美国高校全日制在校人数 (总计12,855,000)





中美高校毛入学率及毕业生数量 (2013年)

中国高等教育毛入学率及毕业生人数



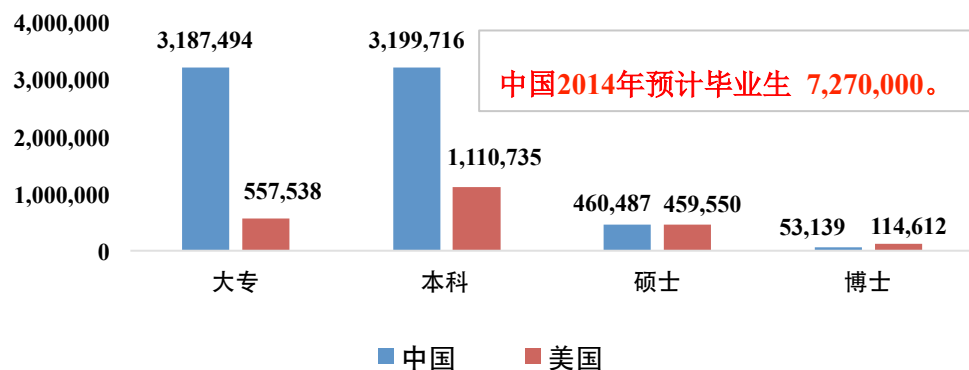
◆ 毛入学率

中国约为 35%；
美国约为 70%。

◆ 毕业人数

中国约为 690 万；
美国约为 230 万。

中美高校全日制毕业生人数 (2013)



◆ 毕业生分类

大专：中国是美国 6 倍；
本科：中国是美国 3 倍；
硕士：中国跟美国相当；
博士：中国是美国 1/2。

*中国数据主要来源于教育部网站发布的各年统计数据，部分数据由教育部相关工作人员直接提供。美国的数据从《Statistical Abstract of the United States-Education: 2012》获得，其中有部分数据是根据推算得到，可能会有误差，但能定性表达量级。



Statistics of Top 500 Ranking (2013)

Rank	Top 20	Top100	Top200	Top300	Top400	Top500
U. S.	17	52	85	108	131	149
U. K.	2	9	19	29	33	37
Switz.	1	4	6	7	7	7
Canada		4	7	16	18	23
Ger.		4	14	23	30	38
France		4	8	16	18	20
Japan		3	9	10	15	20
Israel		3	4	4	6	7
China			7	13	26	42

Source: Jiaotong University Shanghai Ranking



ShanghaiTech University: Missions

- ◆ Meet the nation's strategic demand for building an innovation-driven economy;
- ◆ Integration of scientific **research and education** (ShanghaiTech and CAS);
- ◆ Integration of **research and industry** (SIAIS, iHuman, and industries)
- ◆ Integration of **education, research, and entrepreneurship** (School of Entrepreneurship and Management)
- ◆ Internationalization (partnership with overseas universities)
- ◆ Creating an eco-system for attracting, retaining, nurturing, utilizing talents!

Shanghai
Synchrotron



SARI



National Center for
Protein Science
•Shanghai

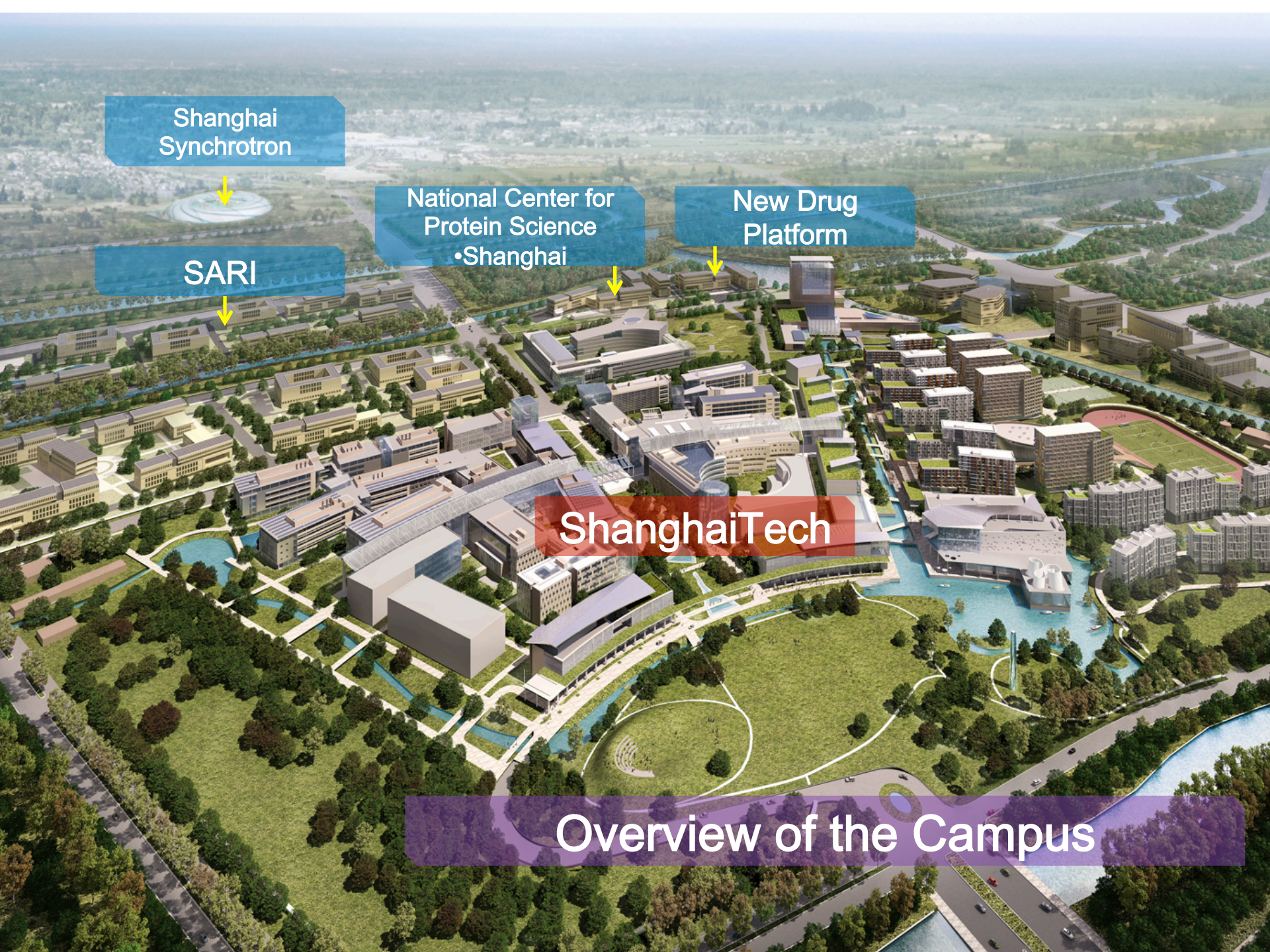


New Drug
Platform



ShanghaiTech

Overview of the Campus





中华民族的伟大复兴（Chinese Dream）不应只是

- 经济建设的复兴

更应包括：

- 科学技术的复兴
- 精神文明的复兴

而将来这一切都取决于**人才教育的复兴**。



过去：一等人忠臣孝子，两件事读书耕田。

如今：一等人知识分子，两件事教书科研。



Thank you!

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