

# China Tech: Invention, Innovation, Technology, Research and Development – Past, Present, Future – 5,000 Years of Progress. A China Rising Radio Sinoland Living Document. By: Jeff J. Brown

<b>Source:</b>	<a href="https://chinarising.puntopress.com/2018/03/20/china-tech-invention-innovation-technology-research-and-development-past-present-future-5000-years-of-progress-a-china-rising-radio-sinoland-living-document/">https://chinarising.puntopress.com/2018/03/20/china-tech-invention-innovation-technology-research-and-development-past-present-future-5000-years-of-progress-a-china-rising-radio-sinoland-living-document/</a>			
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## Time Lags between Chinese Inventions and Discoveries and Their Later Adoption or Recognition in the West / 中国发明发现的时间及其在西方的采纳或识别

*Reference: The Genius of China, (1986, by Robert Temple), a short summary of Dr. Joseph Needham's multi-volume work ( Science and Civilization in China, 1954-2016), where it has been calculated that at least 60% of Western "inventions" and "discoveries" were taken from the Chinese. The actual number of "Chinese first" innovations climbs into the many thousands, as reflected in Needham's massive collection containing over 22 million words and expanding, as archival documents and books are continuing to be translated. /*  
*参考文献：中国的天才（1986年，作者Robert Temple），在Joseph Needham博士（李约瑟）的多卷作品摘要（中国的科学与文明，1954年至2016年）中，发现其中至少有60%西方“发明”和“发现”源自中国。藉此“中国的第一发现”实际数量攀升到数千，反映在李约瑟的大量收藏中，其中的2200万字，档案文件和书籍正在陆续翻译。*

Note: round numbers like (200) and 2000 mean 2nd century BC and 20th century AD, respectively. The list of innovations is from earliest to latest, in each category. Categories are listed in alphabetical order. /  
 注释：如（200）和2000等整数分别表示公元前2世纪和公元20世纪。各类别的创新的清单按从古至今排序。每个类别以字母排序。

<u>Category / 种类</u>	<u>Invention-Discovery / 发明-发现</u>	<u>Chinese</u>	<u>Western</u>	<u>Lag Time -</u>
		<u>Century - Year /</u> <u>中国世纪 - 年</u>	<u>Century - Year /</u> <u>西方世纪 - 年</u>	<u>Years / 滞后时期</u> <u>- 年</u>
Agriculture / 农业	Stone plows, Mesopotamia / 石犁, 美索不达米亚	(4500)	(3000)	1,500
	Row cultivation of crops and intensive hoeing / 栽培作物与集约耕种	(600)	1600	2,200
	Cast iron plow / 铸铁犁	(600)	1600	2,200
	Efficient horse harness - trace / 高效的马具 - 缰绳	(400)	100	500
	Efficient horse harness - collar / 高效的马具 - 项圈	(300)	700	1,000
	Fully "modern", curved, moldboard plow / "现代"化弯曲犁壁	(300)	1600	1,900
	Rotary winnowing fan / 旋转式簸箕	(200)	1800	2,000

	Multi-tube ("modern") seed drill / “毕其功于一役”的耨车	(200)	1600	1,800
	Swan-necked hoe with interchangeable blades / 天鹅颈锄可更换刀片	(100)	1600	1,700
	Animal drawn hoes = "modern" harrow / 畜力锄头 = “现代” 耙	200	1600	1,400
<b>Astronomy &amp; Cartography / 天文和地图学</b>	Recognition of sunspots as solar phenomena, Kang Te / 識別出太陽黑子是太陽活動	(400)	1600	2,000
	Sky catalogues, Greece / 星表, 希臘	(400)	(200)	200
	Raised relief maps, Ma Yuan / 凹凸地圖, 馬遠	100	1400	1,300
	Quantitative cartography, by Chang Heng / 地圖學, 張衡	200	1500	1,300
	Discovery of solar wind / 太阳风的发现	600	2000	1,400
	"Mercator" map projection / "墨卡托"地图投影	1000	1600	600
	Mounted equatorial astronomical instruments, copied by Tycho Brahe / 安装赤道天文仪器, 重做于第谷·布拉赫	1300	1600	300
<b>Domestic &amp; Industrial Technology / 家庭和工业技术</b>	Lacquer - the first plastic / 树脂和漆器 - 第一个塑料	(1300)	1900	3,200
	Strong beer ( <i>sake</i> ) / 米酒	(1100)	NEVER / 总不	NEVER / 总不
	Petroleum and natural gas as fuel / 石油和天然气利用	(400)	1900	2,300
	Paper / 纸	(200)	1200	1,400
	Wheelbarrow / 独轮车	(100)	1200	1,300
	Sliding calipers / 滑动式测径器	(100)	1600	1,700
	Magic lantern / 走马灯	200	2000	1,800
	Fishing reel / 渔线轮	300	1700	1,400
	Stirrup / 马镫	300	600	300
	Porcelain / 陶瓷	300	2000	1,700
	Biological pest control / 生物防治	300	1900	1,600
	Umbrella / 雨伞	400	1600	1,200
	Matches / 火柴	577	1577	1,000
	Chess / 象棋	600	1100	500
	Brandy and whisky / 高粱类酒精饮料	700	1200	500
	Mechanical clock / 齿轮结构报时系统	725	1310	585
	Printing - block / 印刷	800	1500	700
	Printing - movable type / 活字印刷	1045	1445	400
	Playing cards / 麻将/马吊	900	1400	500
	Paper money / 纸钞	900	1750	850

	Permanent lamps / 长明灯	900	NEVER / 总不	NEVER / 总不
	Spinning wheel / 转轮	1100	1300	200
<b>Engineering / 工程学</b>	Spouting bowls and standing waves / 鱼洗铜盆和驻波	(500)	NEVER / 总不	NEVER / 总不
	Cast iron / 铸铁	(400)	1300	1,700
	Double acting piston - air / 空气用双作用活塞	(400)	1500	1,900
	Double acting piston - liquid / 液体用双作用活塞	(400)	1700	2,100
	Malleable iron / 可塑形的铁	(300)	1300	1,600
	Crank handle / 曲柄把手	(200)	900	1,100
	Gimbals or "Cardan suspension" / 平衡环、万象悬架	(200)	900	1,100
	Manufacture of steel from cast iron / 铁铸成钢的制造	(200)	1800	2,000
	Deep drilling for natural gas / 钻入地表深层取得天然气	(100)	1800	1,900
	Belt drive = drive belt / 皮带传动	(100)	1700	1,800
	Water power / 水能	100	1300	1,200
	Chain pump / 链泵 (用链操作的抽水机)	100	1500	1,400
	Suspension bridge / 吊桥	100	1900	1,800
	First cybernetic machine / 首个可操控机器	300	1900	1,600
	Essentials of steam engine / 蒸汽机的基本配置	500	1700	1,200
	Magic mirrors / 透光镜	500	2000	1,500
	"Siemen's" steel process / "西门子"生铁炼钢 (脱碳)	500	1800	1,300
	Segmental arch bridge / 不成连贯的拱桥 (拱桥)	610	1110	500
	Chain drive / 利用链条传送动力的装备	976	1776	800
	Underwater salvage operations / 于水下的排泄物处理系统	1100	1900	800
<b>Magnetism / 磁性</b>	First compass / 第一个指南针	(400)	1100	1,500
	Dial and pointer devices / 刻度盘与指针	300	1500	1,200
	Magnetic declination of the Earth's magnetic field / 地球磁场的磁力偏差	900	1500	600
	Magnetic remanence and induction / 剩磁和归纳	1100	1700	600
	Decimal system / 小数系统	(1400)	900	2,300
	A place for zero / 零的地位	(400)	1000	1,400
	Negative numbers / 负数	(200)	1500	1,700
	Extraction of higher roots and solutions of higher numerical equations / 提取高次算式的根	(100)	500	600

<b>Mathematics / 数学</b>	Decimal fractions / 以十的倍数为底的分数	(100)	1500	1,600
	Solving cube roots with fractions, Lagrange / 用分数表示三次根	(100)	1800	1,900
	Using algebra in geometry, Fibonacci / 几何中的代数	300	1300	1,000
	A refined value of pi, Liu Hui / Pi的精细值, 刘徽	300	1500	1,200
	Solving cube roots with decimals, Liu Hui vs. Horner / 用小数解三次根	300	1900	1,600
	Solving cubic equations, Wang Xiaoteng vs. Scipione del Ferro / 解三次算式	700	1500	800
	"Pascal's" triangle of binomial coefficients, Liu Juxi / "帕斯卡"多项式项数, 刘菊喜	1100	1527	427
	Equations higher than cubes, Qin Jiushao / 三次以上算式, 秦九韶	1300	1600	300
	<b>Medicine &amp; Health / 医学和健康</b>	Acupuncture / 针灸	(1500)	2000
Circulation of the blood / 血液循环		(600)	1200	1,800
Circadian rhythms in human body / 人体生理节律		(200)	1950	2,150
Science of endocrinology / 内分泌系统学		(200)	1900	2,100
Deficiency diseases (like goiter) / 营养缺乏病		300	1900	1,600
Diabetes discovered by urine analysis / 糖尿病发现尿液分析		700	1700	1,000
Use of thyroid hormone, Dr. Chen Chuan / 甲状腺激素的使用, 陈博士		700	1950	1,250
Immunology - inoculation (smallpox) / 免疫学, 疫苗接种(天花)		1000	1800	800
<b>Physical Sciences / 自然科学</b>	Geo-botanical prospecting / 植被生态学	(500)	1600	2,100
	First Law of Motion (Mohist School) / 物体运动第一定律 (墨子哲学)	(400)	900	1,300
	Hexagonal structure of snowflakes / 雪花的几何形态	200	2000	1,800
	Seismograph, Chang Heng / 地动仪	130	1530	1,400
	Spontaneous combustion / 凭空自燃	200	1700	1,500
	"Modern" geology, James Hutton was ridiculed / "现代"地理学	200	1785	1,585
	Phosphorescent paint / 复合颜料	1000	1750	750
	Large tuned bell / 大型编钟	(600)	1900	2,500
	Tuned drums / 调鼓	(200)	UNKNOWN / 未知	UNKNOWN / 未知

Sound & Music / 声音和音乐	Hermetically sealed research laboratories / 密封的研究实验室	(100)	1900	2,000
	First understanding of musical timbre / 初次对音色有所了解	300	1900	1,600
	Equal temperament in music, Zhu Zaiyu - completely revolutionized European music / 音阶体系中的平均律, 朱载堉 - 朱载堉-彻底改革欧式音乐	1584	1634	50
Transportation & Exploration / 运输和探索	Kite (military, messages, fishing, music) / 风筝 (军事, 信息, 渔业, 音乐)	(450)	1550	2,000
	Manned flight with kites / 载人风筝	(400)	1250	1,650
	First relief maps / 第一地形图	(300)	1300	1,600
	First contour transport canal / 第一运河 (灵渠)	(300)	1600	1,900
	Working parachute / 降落伞	(200)	1800	2,000
	Miniature hot air balloon / 微型热气球	(200)	1200	1,400
	Rudder / 船舵	100	1200	1,100
	Balanced Rudder / 平衡舵	100	1900	1,800
	Masts and sailing - batten sails & staggered masts / 桅杆和船帆-木条帆&纵横交错的桅杆	200	NEVER / 总不	NEVER / 总不
	Masts and sailing - multiple masts & fore + aft rigs / 桅杆和船帆-多桅杆&船头+船尾的平台	200	1400	1,200
	Masts and sailing - watertight compartments in ships / 桅杆和船帆-船舶水密舱	200	1900	1,700
	Masts and sailing - leeboards / 桅杆和船帆-下风板	800	1600	800
	Helicopter rotor & the propellor / 直升机旋翼&螺旋桨	400	1900	1,500
	Paddle wheel boat (90m long, 800 soldiers) / 明伦轮船 (长90米, 800士兵)	500	1500	1,000
	Land sailing / 陆地航行	550	1600	1,050
Canal pound lock, Qiao Weiyue / 为阻拦河水而设计的闸门, 乔伟月	984	1384	400	
Fenestrated rudder / 开孔舵	1300	2000	700	
	Chemical warfare: poison gas, smoke bombs and tear gas / 化学武器: 毒气, 烟气, 和催泪瓦斯	(400)	1900	2,300
	Crossbow, Mr. Qin, with metal trigger / 石弓, 秦先生, 有金属触发的	(200)	0	200
	Gunpowder / 火药	900	1200	300
	Flame thrower / 火焰喷射器	1000	2000	1,000

Warfare / 战争	Flares and fireworks / 信号弹和烟火	1000	1250	250
	Soft bombs and grenades / 软弹和手榴弹	1000	1400	400
	Gunpowder loaded arrows / 火药装箭	1000	1550	550
	Repeating crossbow / 连射十字弓	1100	1700	600
	Rocket / 火箭	1100	1300	200
	Guns, cannons and mortars - fire lance / 枪, 大炮, 迫击枪-火枪	1120	1570	450
	Metal cased bombs / 金属套管的炸弹	1221	1467	246
	Land mines / 地雷	1277	1403	126
	Guns, cannons and mortars - true gun / 枪, 大炮, 迫击枪-真枪	1280	1330	50
	Venturi principle / 文丘里原理	1300	1800	500
	Repeating guns / 连发枪	1300	1600	300
	Winged rocket (WWII V2) / 带翼火箭 (二战时期)	1400	2000	600
	Sea mines / 水雷	1400	1600	200
	Multi-staged rockets / 多级火箭	1400	2000	600
Average lag time in years, China innovating before the West / 平均之后时间差 (年) :		<b>243</b>	<b>1489</b>	<b>1,231</b>

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