Bhāratīya Jñāna Parampará: Quo vadis?

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Member, CAG for IKS, NEP2020

Outline

- Introductory Remarks
- Illustrative examples
  - Iron
  - Pañcaloha/aṣṭadhātu
    - Corrosion resistance
    - High entropy alloys?
  - Aranmula mirrors
  - Metallic drug formulations (-> comment on aqua regia)
- Concluding remarks
- QnA

Introductory Remarks

- Vedas ---------- Modern Science
- Viśvaguru Syndrome
  - यदिहास्ति तदन्यत्र। यन्नेहास्ति न तत् क्वचित्
  - whatever has been said here may be found elsewhere, but whatever is not found here does not exist anywhere else!
  - धर्मे चार्थे च कामे च मोक्षे च भरतर्षभ |

  यदिहास्ति तदन्यत्र। यन्नेहास्ति न तत् क्वचित्॥(१/६२/५३)
- What is not BKS/IKS?
  - Nārāyaṇa sūkta
  - मत्तः परतरं नान्यत्किञ्चिदस्ति धनञ्जय।

  मयि सर्वमिदं प्रोतं सूत्रे मणिगणा इव।।7.7।।

Iron Technology

A typical sword made of wootz steel (about 18th century); the hilt is of iron and coated with a thick layer of gold. (Courtesy: R. Balasubramaniam)

(b) *Application of paints on iron beams and pillars.*

Besides the question of the composition of Indian iron the author has a suspicion in his mind that the pillars and beams were originally *painted*. Direct evidence on this point is also forthcoming, as Abul Fazal in the 16th century saw the beams at Puri painted.[2] The peculiar colour of the iron, specially at the top portion of the Delhi pillar, which misled early observers into thinking that the pillar was made of copper or bronze, might have been due to some kind of paint used for painting the pillar. The author

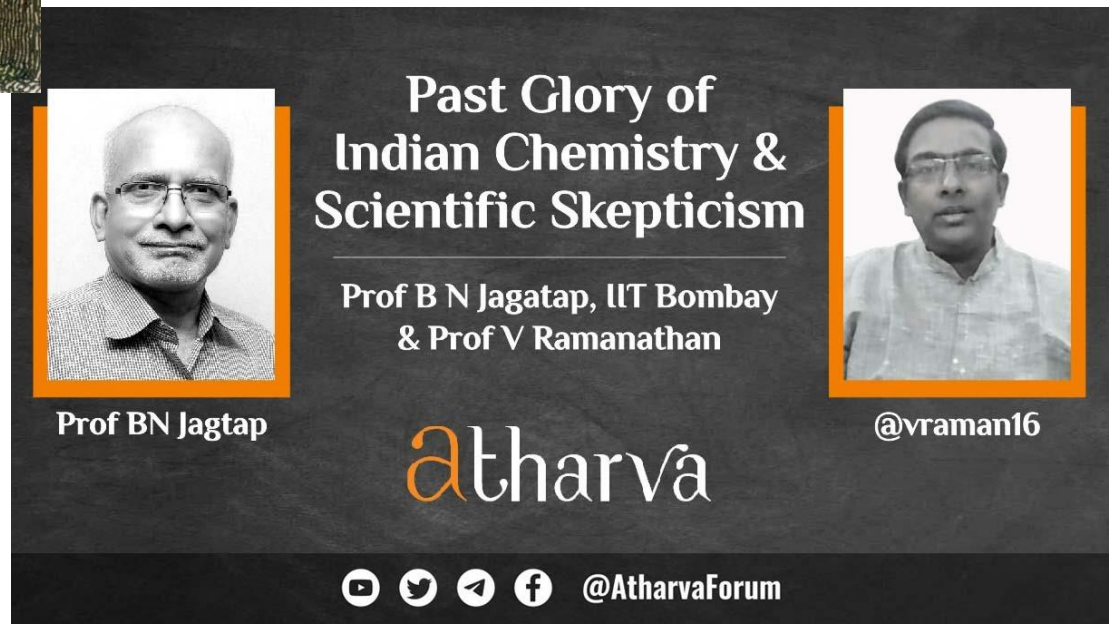
Images taken from : Indian Contributions to Science; Compiled by Vijnana Bharati; 4th Edition; 2019

"Iron in Ancient India"; P. Neogi; IACS Calcutta 1914

Pic Courtesy: https://www.britannica.com/topic/Menai-Bridge

Menai Suspension Bridge:
Indian Connection

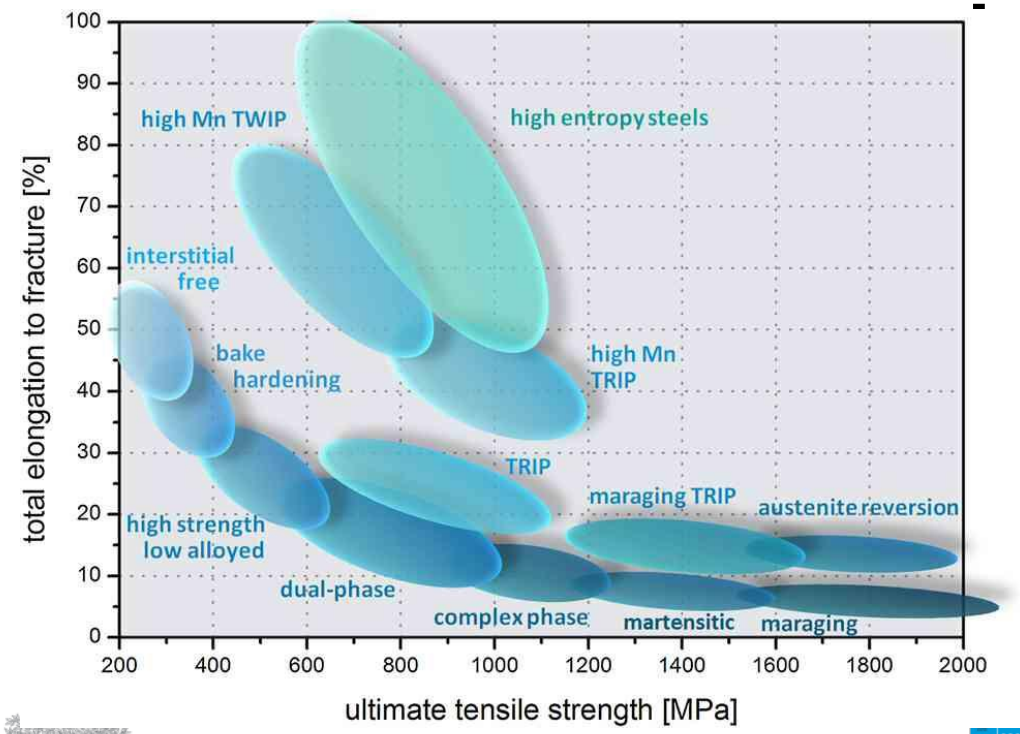
https://www.youtube.com/watch?v=XD7rHKY5uEw



Corrosion resistant iron

Pañcaloha/Aṣṭadhātu: Corrosion Resistant

Pañcaloha/Aṣṭadhātu: High entropy alloy



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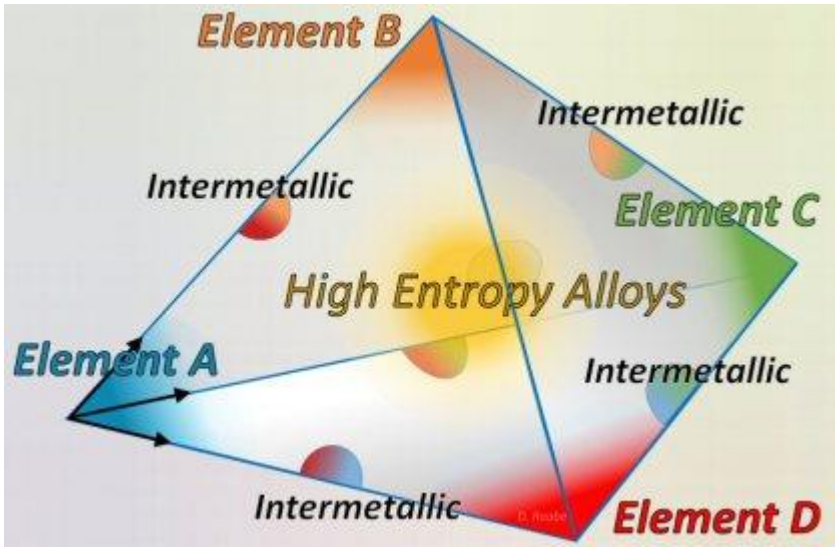

Isotope alloys

A.K. Vasudevan [a], J.J. Petrovic [b]

[a] Retired Office of Naval Research, Reston, VA, USA

[redacted]eral, FL, USA

Recently since 2000, another process has emerged called “high entropy alloys” [6]. Here several solutes can be added that is beyond the solubility limits to form ingot alloys with interesting mechanical properties. This process is similar to the “Panchaloha” process in ancient India.

Aranmula Mirror

JOM
DOI: 10.1007/s11837-015-1524-3

Ancient Metal Mirror Alloy Revisited: *Quasicrystalline Nanoparticles Observed*

J.A. SEKHAR,[1,2,3] A.S. MANTRI,[2] S. YAMJALA,[4] SABYASACHI SAHA,[4] R. BALAMURALIKRISHNAN,[4] and P. RAMA RAO[5,6]

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This article presents, for the first time, evidence of nanocrystalline structure, through direct transmission electron microscopy (TEM) observations, in a Cu-32 wt.% Sn alloy that has been made by an age-old, uniquely crafted casting process. This alloy has been used as a metal mirror for centuries. The TEM images also reveal five-sided projections of nano-particles. The convergent beam nano-diffraction patterns obtained from the nano-particles point to the nano-phase being quasicrystalline, a feature that has never before been reported for a copper alloy, although there have been reports of the presence of icosahedral 'clusters' within large unit cell intermetallic phases. This observation has been

Curr Opin Pediatr. 1994 Jun;6(3):289-94.

Iron poisoning in children.

Anderson AC[1].

J Med Toxicol. 2014 Dec;10(4):395-8. doi: 10.1007/s13181-014-0389-0.

Chronic arsenic poisoning following ayurvedic medication.

Pinto B[1], Goyal P, Flora SJ, Gill KD, Singh S.

Eur J Clin Pharmacol. 2002 Feb;57(12):891-6.

Heavy metals in traditional Indian remedies.

Ernst E[1].

tensive Care. 2015 Sep;43(5):669-70.

Lead poisoning in Australia associated with privately imported Ayurvedic complementary medicine.

Orchard GR[1], Hielscher KA[1], Wilke AD[1], Thomae MK[1], Presneill JJ[1].

Public and scientific issues

1. No contemporary data available pertaining to its standard preparation and efficacy
2. Repeated reports of metal toxicity associated with usage of traditional medicine

Traditional Practioner's Claim

1. Almost all the metals and minerals are used as medicine
2. Metals are converted in to medicine, if prepared strictly following traditional procedures
3. They do not produce any toxicity at prescribed therapeutic doses and duration
4. Legally practiced in India[1]

[1]Drugs and cosmetic act, 1940

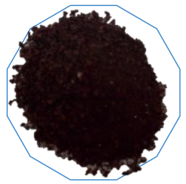
Toxicity and other related issues of HMPs

Saper *et al*., JAMA: 2004 292:2868-2873 & 2008 300:915- 923
14/70 Ayurvedic HMPs from US market with high metal content (lead, arsenic and mercury)

- ❑ Affected health policies in several countries
- ❑ Banning the marketing of products incriminated by Saper *et al*.
- ❑ Discouraging the public from consuming these formulations

Caveats:
did not test the bioavailability of the detected metals
intoxication cases in metal toxicity due to Ayurvedic HMPs since 1978 = ~55

Koch et al: Chinese HMP with high Arsenic content, only 4% bio-available (Toxicol Appl Pharmacol 222:357-64, 2007)
Jie Liu et al: safety of cinnabar containing drugs should not be evaluated by mercury content alone (*Mercury in traditional medicines: Is cinnabar toxicologically similar to common mercurials?* 2008, 233, 7)



Trituration

Purified *Kāntam*

Musa paradisica rhizome

Ficus racemosa latex

Trituration for 12 hours

Limonia acidissima bark

Ficus racemosa latex

Trituration for 12 hours

Moringa oleifera bark

Ficus racemosa latex

Trituration for 12 hours

Citrus limon fruit

Ficus racemosa latex

Trituration for 12 hours

Kānta chentūram (KC)

Kānta parpam (KP)

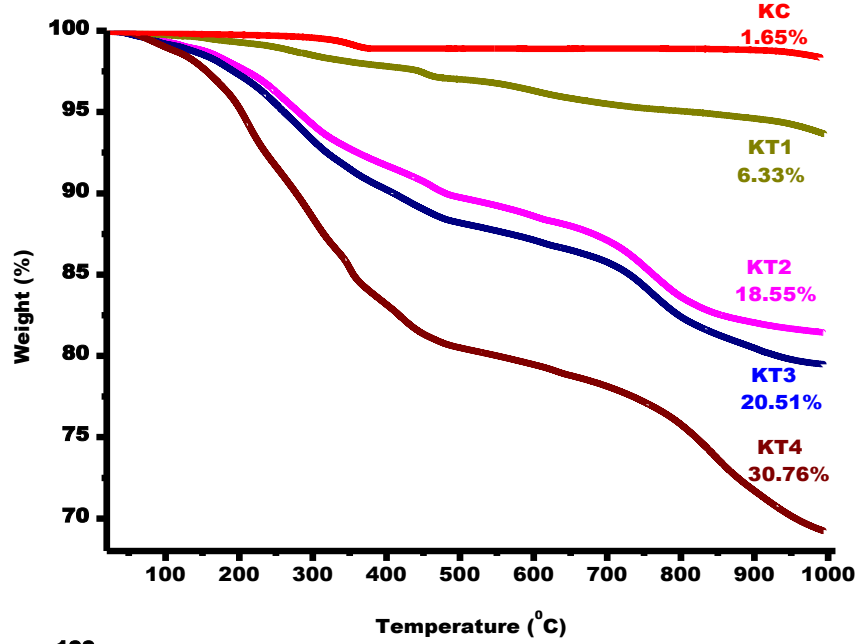
Made into pellets and dried

Total time required for trituration:
6 continuous days

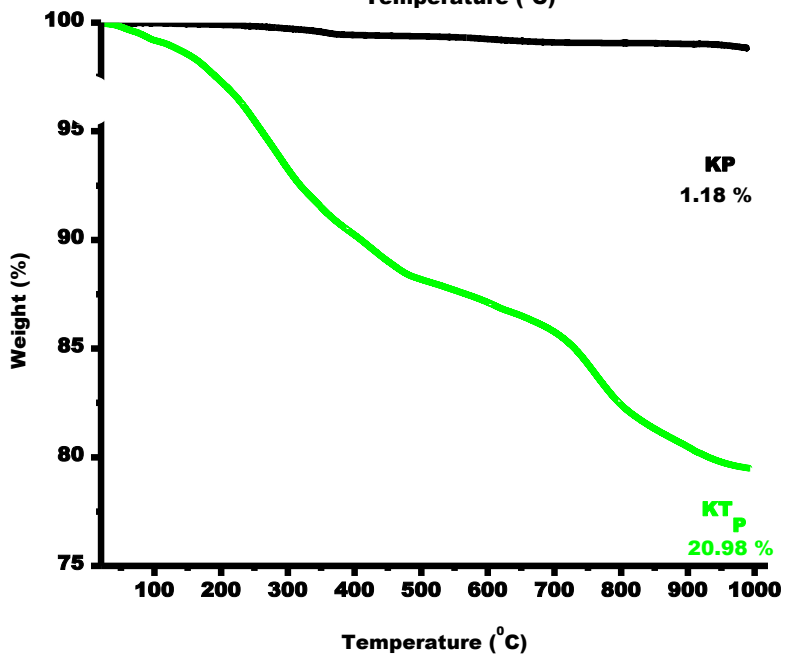
No organic materials are present in KC and KP

TGA Analysis

Organic materials added during preparation gets degraded during calcination



KC



KP

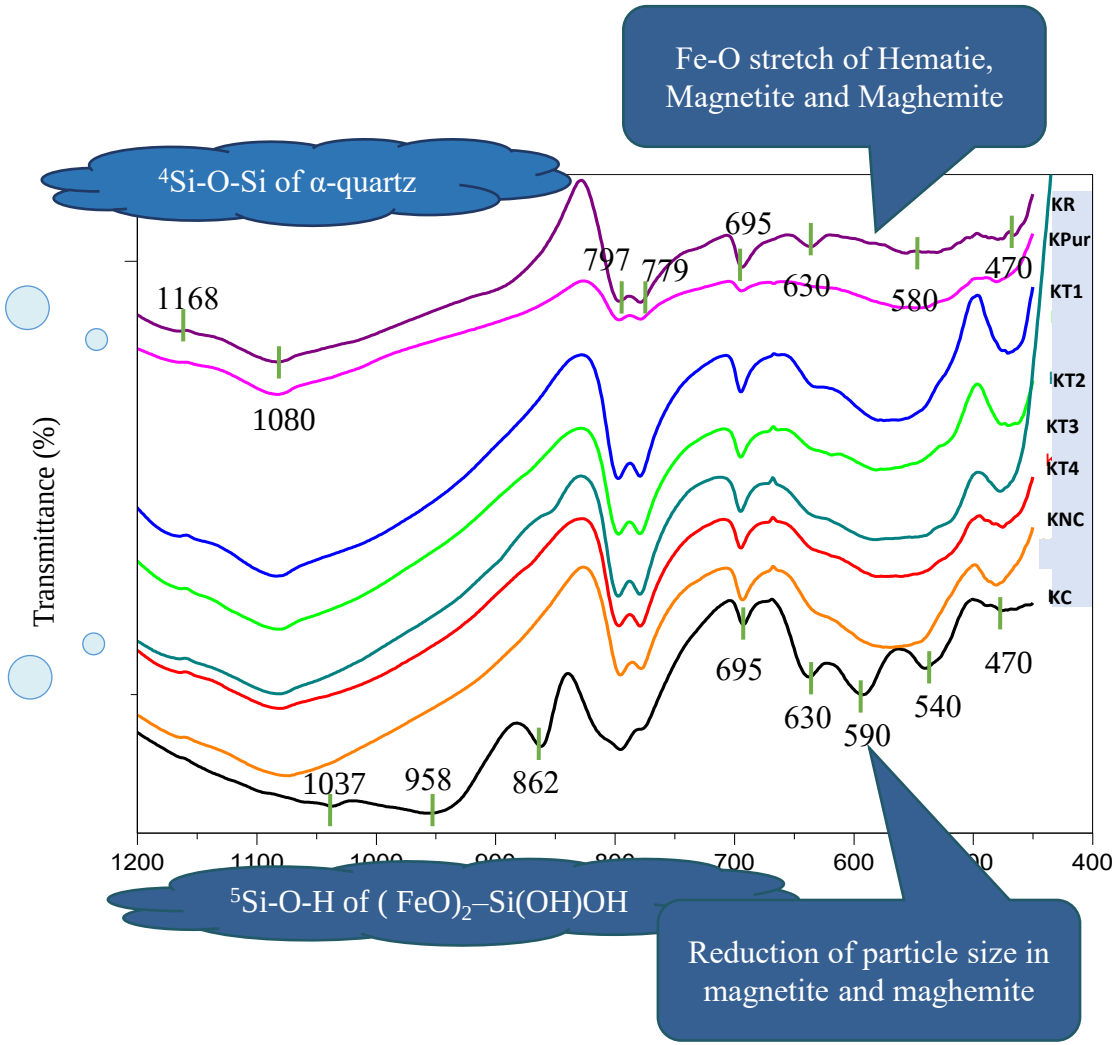
KT1 & KTP are intermediates from calcination of KC and KP respectively

Raw, purified, triturated intermediates and negative contol product are similar

TGA Analysis

IR Spectroscopy

α-quartz present in the raw material gets transformed to silica coating during preparation



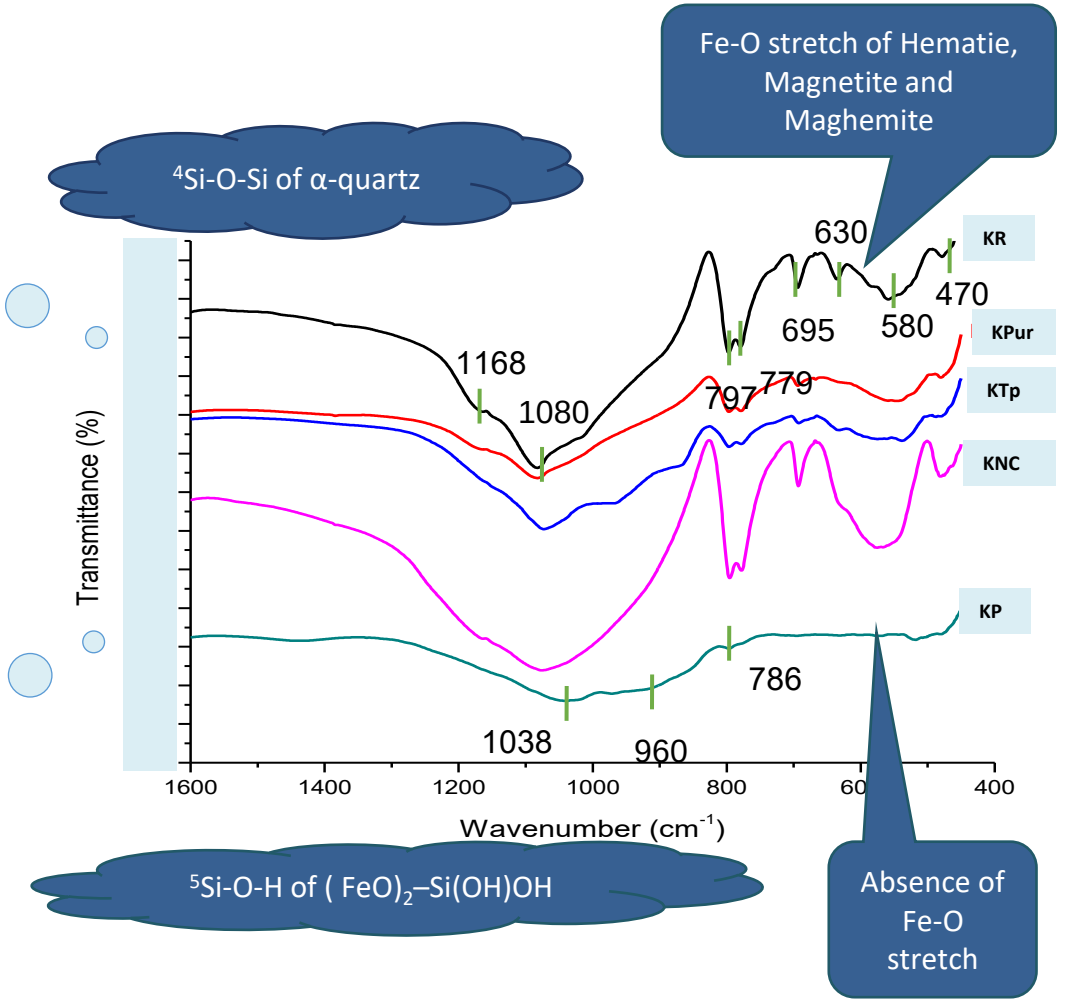
[5]Namduri et al, *Corrosion Science*.50, 2493-9; 2008.

Same kind of silica coating occurs in KP also

TGA Analysis

IR Spectroscopy

Fe-O peaks are absent



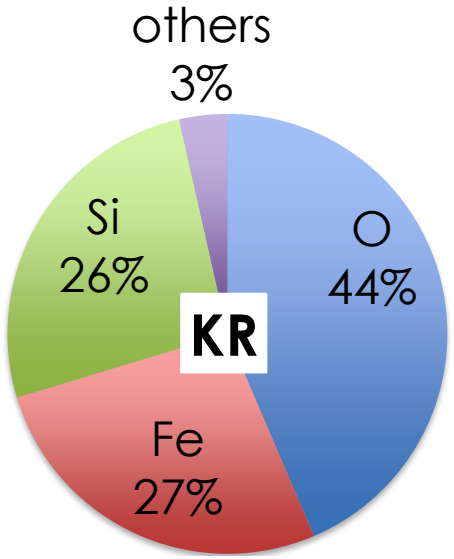
[5]Namduri et al, *Corrosion Science*.50, 2493-9; 2008.

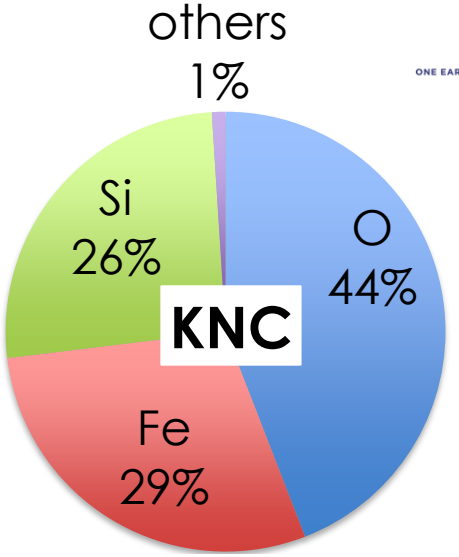
X-Ray fluorescence spectroscopy

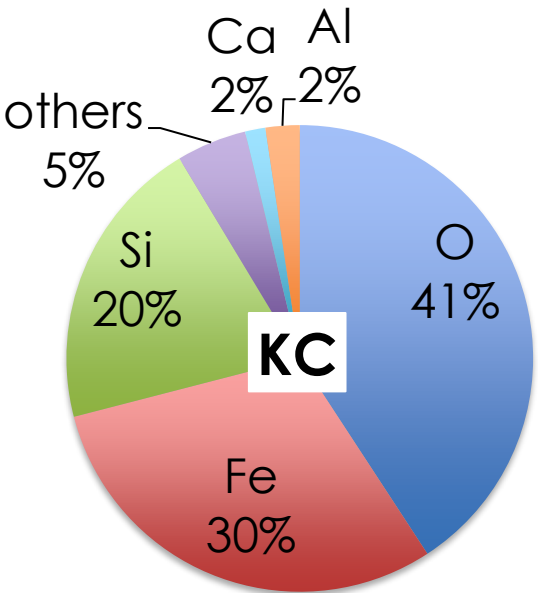
[6]Presence of Ca-Si masks the Fe-O peaks in IR spectra

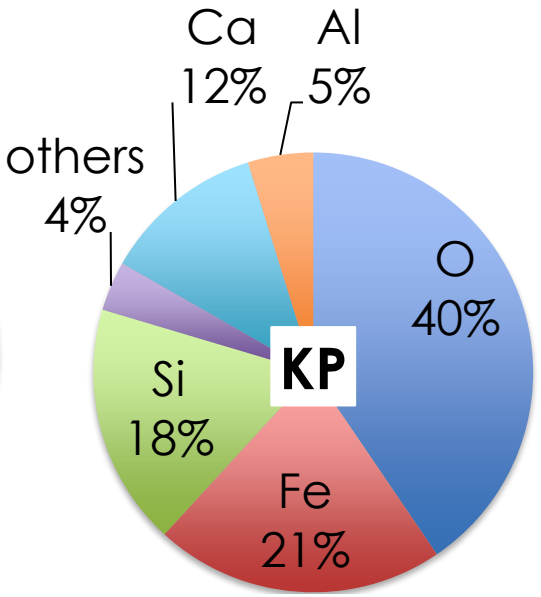
X-Ray diffraction

Ca and Al percentage increases in KP









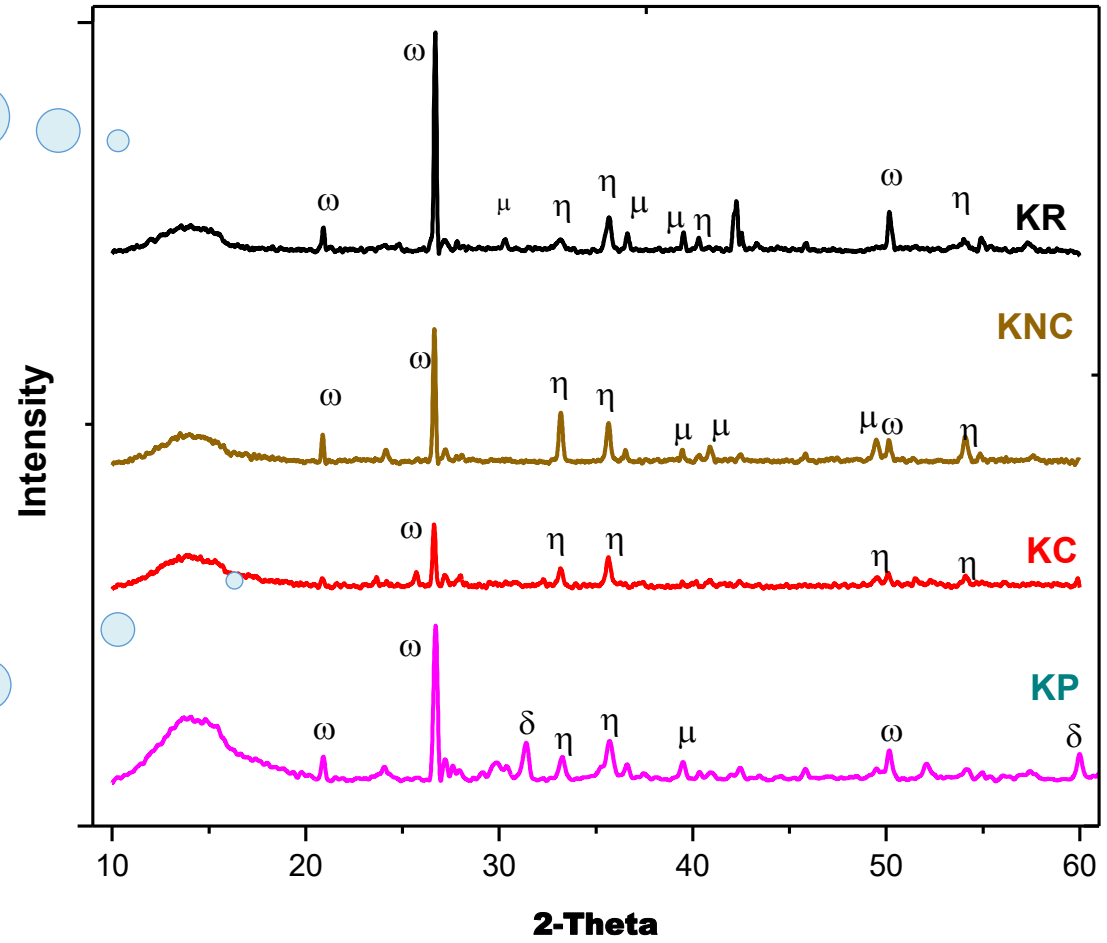
Silica is present in all the samples

IR Spectroscopy

X-Ray diffraction spectroscopy

Hematite is present in all the samples

[7] η hematite (2θ: 33.15˚, 35.68˚, 40.32˚),
ω Silica (2θ: 20.92˚, 26.69˚, 50.16˚) and
μ maghemite (2θ: 30.31˚, 36.62˚, 39.52˚, 42.26˚)
δ Calcium silicon (31.96, 61.1)



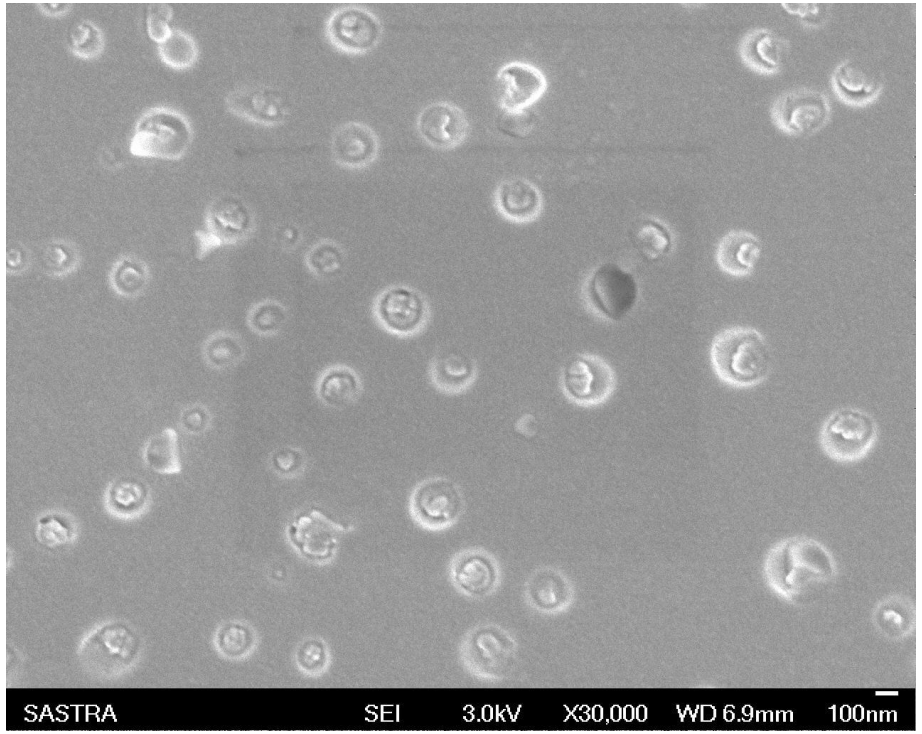
[7] Camden R. Hubbard, JCPDS, 1981, 37-61

Particles are few hundred nanometers in diameter

IR Spectroscopy

X-Ray diffraction spectroscopy

Scanning electron microscopy



Summary

- No herbal ingredients are present in KC and KP
- KP and KC is composed of polysilicate coated iron oxide
- Besides, KP also has calcium and aluminium compounds
- This transformation occurs at low temperature of 900^0C (Melting point of Silica is above 1500^0C)
- Above listed transformations are not seen in KNC

Conclusion

- Herbs play an inevitable role in the physico-chemical transformation of the raw material to drug formulation

Anti-hemolytic activity

Study design

Ethical committee approval number: 260/SASTRA/IAEC/RPP

Hematology

1. Leukocytes
2. Lymphocytes
3. Neutrophils
4. Monocytes
5. Basophils
6. Erythrocytes
7. Hemoglobin
8. Mean corpuscular volume
9. Mean corpuscular hemoglobin
10. Mean corpuscular hemoglobin concentration
11. Reticulocytes
12. Platelets
13. Mean platelet volume

Biochemistry

1. Total bilirubin
2. Direct bilirubin
3. Indirect bilirubin
4. Glucose
5. Urea

Histopathology

1. Spleen
2. Liver
3. Bonemarrow
4. Pancreas

Group	No. of Rats	Drug Administration Schedule	
		Drug	No. Of Days
Group I (Normal Control)	8	Normal Saline	1st-20th day
Group II (Disease Control)	8	Normal Saline	1st-20th day
Group III (Standard Control)	8	5mg/kg of folic acid	1st-20th day
Group IV (Drug I)	8	18.5 mg/kg of KC dispersed in honey	1st-20th day
Group V (Drug II)	8	18.5 mg/kg of KP dispersed in honey	1st-20th day
Group VI (Drug III)	8	18.5 mg/kg of KNC dispersed in honey	1st-20th day

Therapeutic dose Calculation:

[8]Animal equivalent dose (rat) = Human dose × Human K_m /Animal K_m

= 3 × 37/6

= 18.5 mg/Kg

[8]Shannon Reagan-Shaw et al. The FASEB Journal, 2008

Pro-mercurialist Vs Anti-mercurialist

~ Up to 1950

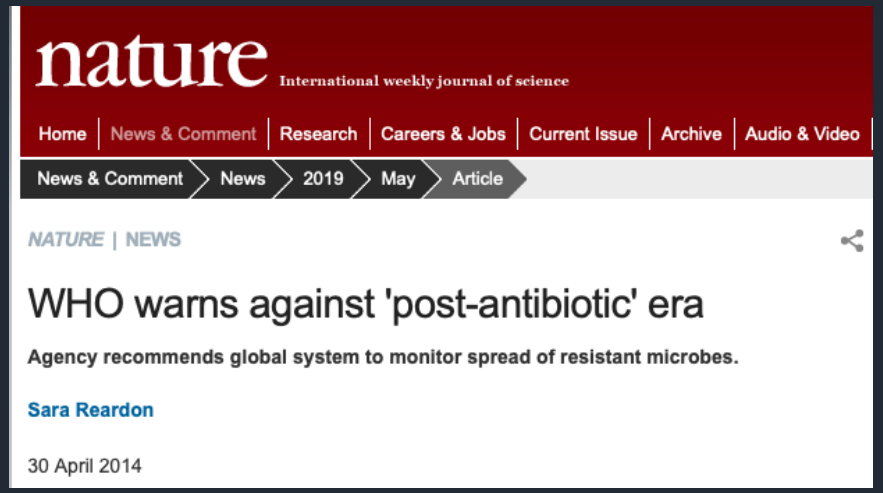
Discovery of Antibiotics![6]

~ After 1950

Pro-mercurialist Vs Anti-mercurialist

[6] ...biology, 2010

Post-antibiotic Era????



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NATURE | NEWS

WHO warns against 'post-antibiotic' era

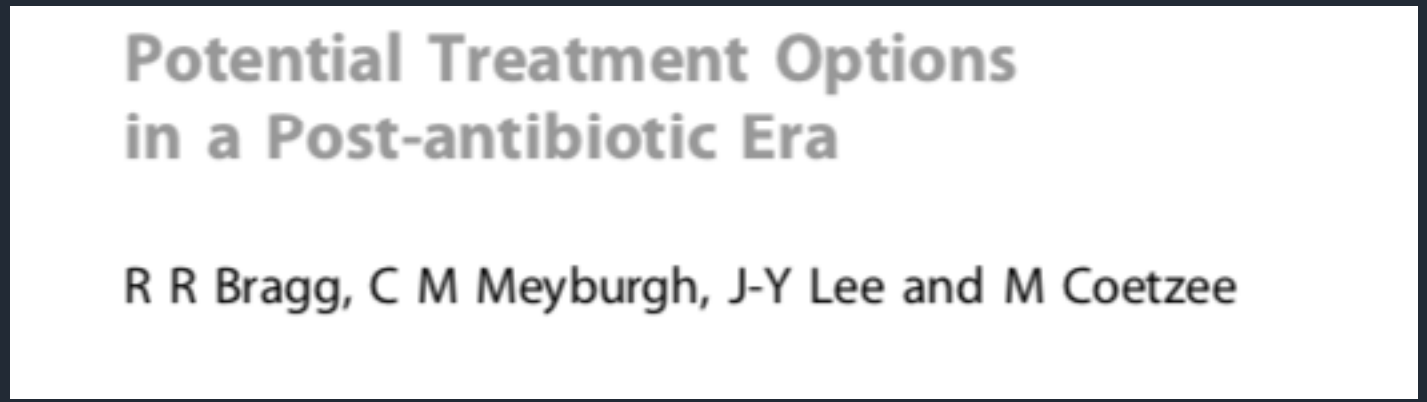
Agency recommends global system to monitor spread of resistant microbes.

Sara Reardon

30 April 2014

1. Herbal products
2. Improved and novel vaccine development
3. The use of bacteriophages and phage-associated enzymes

4. **Herbo-metallic drugs**

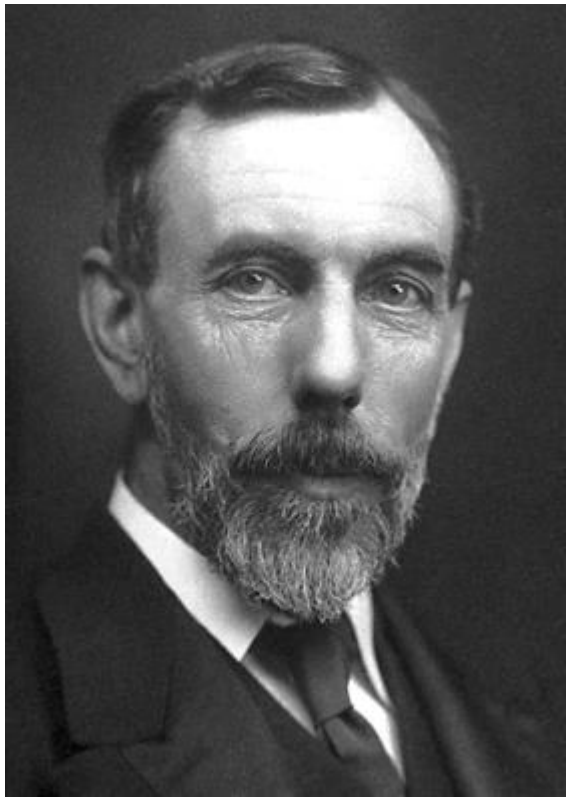


Potential Treatment Options in a Post-antibiotic Era

R R Bragg, C M Meyburgh, J-Y Lee and M Coetzee

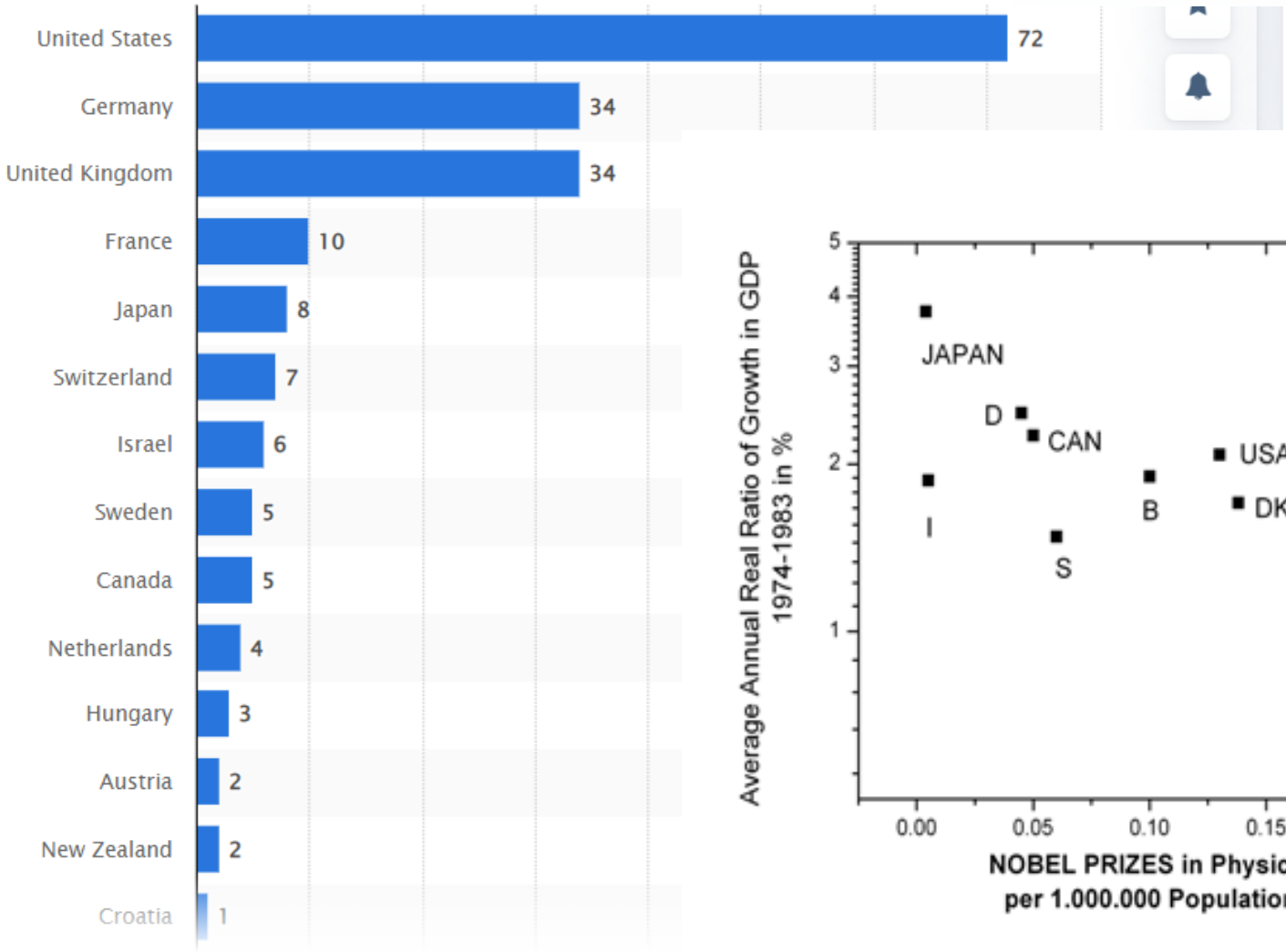
William Ramsay
KCB FRS FRSE

"The country which is in advance of the rest of the world in chemistry will also be foremost in wealth and in general prosperity."



Number of Nobel Prize Laureates for chemistry by nationality

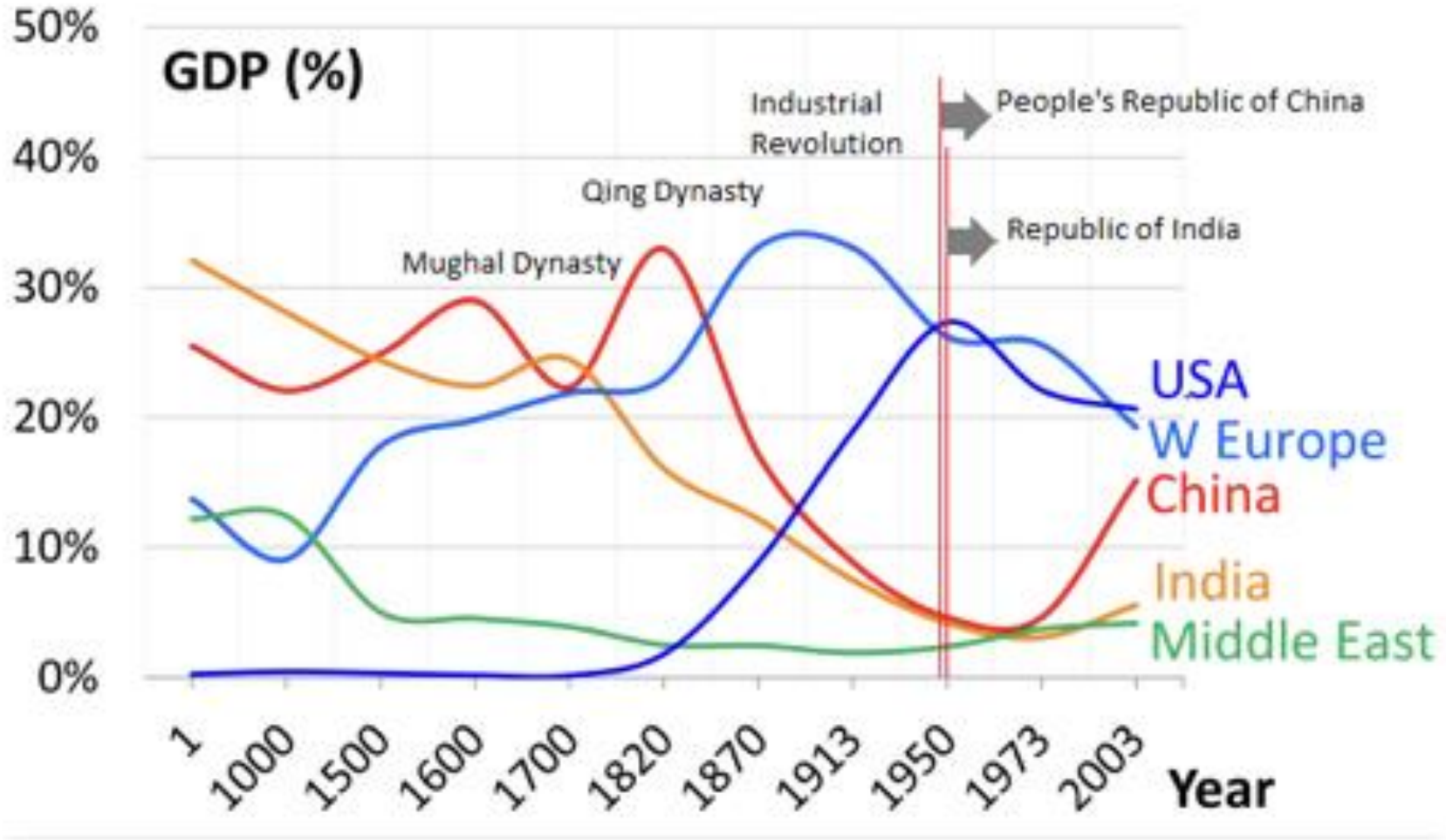
1901-2021



Expand statistic

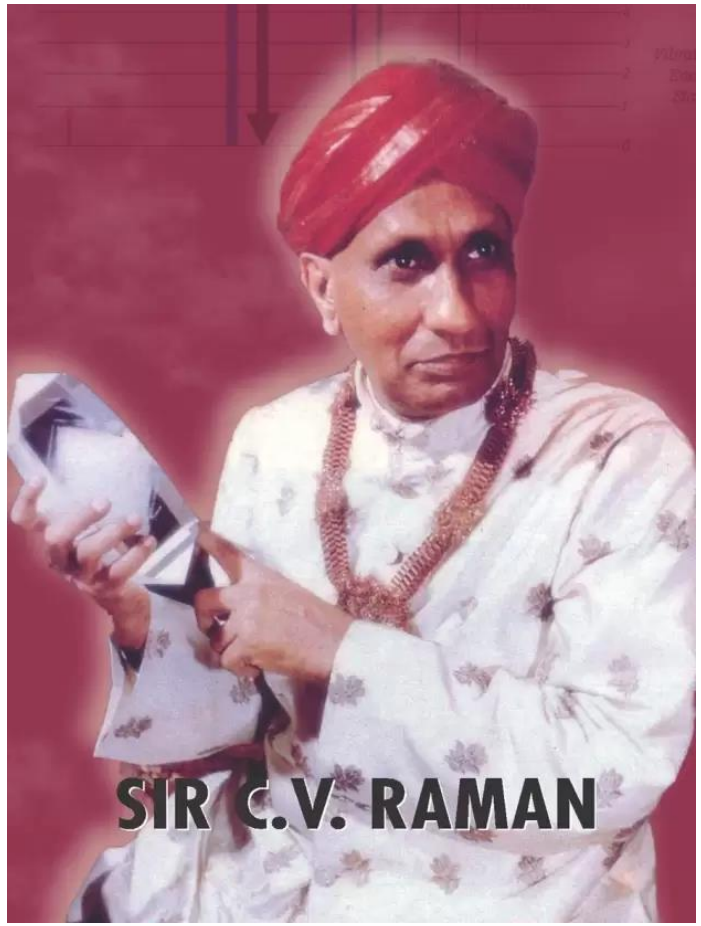
https://www.researchgate.net/publication/46462376_Eduction_and_Economy_--_An_Analysis_of_Statistical_Data

https://www.statista.com/statistics/262895/nobel-prize-laureates-for-chemistry-by-nationality-since-1901/



Data from Angus Madison (Taken from the site: https://www.nipfp.org.in/blog/2016/11/15/empire-and-extraction/)

Concluding Remarks



पुराणमित्येव न साधु सर्वं (*purANamityEva na sAdhu sarvam)*

न चापि काव्यं नवमित्यवद्यम्। (*na CApi kAvyam navaityavadhyam)*

सन्तः परीक्ष्यान्यतरद्भजन्ते (*santah parIkSyAntarbhajantE*)

मूढः परप्रत्ययनेयबुद्धिः॥ (mUDhah parapratyayanEyabuddhih*)*

BHU Convocation Address, 1926

College grounds. I remarked to Sir Ernest, a little mischievously,—"It seems to me Cambridge is a place for play and not for study". Sir Earnest turned round and said: "We do not try to grow bookworms here. We train men who can govern an Empire". That was

Thank You

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