India's share of world research according to Science and Engineering Indicators 2018

The 2018 report of Science and Engineering Indicators[1] shows that China and India continue to rise, while the developed economies seem to slow down, as shown in these pages earlier[2–6].

Appendix table 5-27 of Science and Engineering Indicators compiles science and engineering (S&E) articles in all fields, by region/country/economy for the period 2003–2016 using a fractional count basis. Appendix table 6-3 arranges the Nominal GDP, again by region/country/economy for the period 2001–2016 in terms of millions of current dollars. These data can be rearranged as shown in Figure 1, so that the world share of publications can be plotted against the world share of nominal GDP. There is linear scaling effect between these two indicators – the higher the share of GDP, the higher is the S&E output (Figure 1).

Figure 1 shows the trajectories of various regions and countries over the period 2003–2016. USA, EU and Japan continue to slow down. China and India show steady progress.

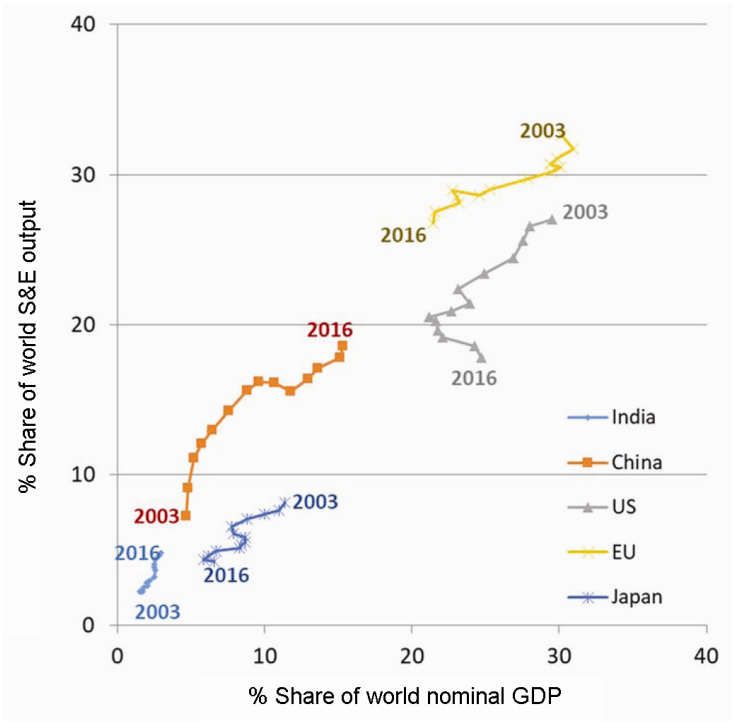

Figure 1. Trajectories of various regions and countries from 2003 to 2016 as world share of publications plotted against the world share of nominal GDP – the higher the share of GDP, the higher the S&E output.

1. https://www.nsf.gov/statistics/2018/nsb20-181/assets/nsb20181.pdf (accessed on 19 January 2018).
2. Prathap, G., *Curr. Sci.*, 2008, **94**, 1113.
3. Prathap, G., *Curr. Sci.*, 2010, **98**, 1160–1161.
4. Prathap, G., *Curr. Sci.*, 2012, **103**, 351–352.
5. Prathap, G., *Curr. Sci.*, 2014, **106**, 649–650.
6. Prathap, G., *Curr. Sci.*, 2016, **110**, 2210.

GANGAN PRATHAP

Vidya Academy of Science and Technology,
Thrissur 680 501, India and
A. P. J. Abdul Kalam Technological University,
Thiruvananthapuram 695 016, India
e-mail: gangan@vidyaacademy.ac.in

EMR exposure

This is regarding the article 'Mobile phone radiation induces sedation in *Periplaneta americana*'[1]. The authors have used 15 adult male cockroaches kept in a 30 × 18 cm box for exposure to electromagnetic radiation (EMR) emitted by a cell phone. The phone was kept in the box and made 1 min call every 5 min for 1, 3 or 6 h. Several assays were performed and the authors concluded 'the present study clearly explained the physiological and biochemical basis of adverse effect of EMR and is a warning for the judicious use of mobile phones'.

Several weaknesses in the study are pointed our here.

(1) The authors did not follow good study design[2].

(2) The study was not conducted 'blind', especially when dealing with the extremely controversial subject of exposure to mobile phones.

(3) There were no positive controls to validate the observations made in EMR-exposed cockroaches.

(4) There was absolutely no dosimetry giving the actual EMR exposure in cockroaches. The authors have just mentioned a standard cell phone, frequency 900 MHz, power 2 W and specific absorption rate (SAR) 0.35. Several cell phones are available for use and the model/make was not specified. The actual power output from the phone depends on the signal strength at the base site. No 'unit' for SAR was mentioned and, the value mentioned (0.35) might have been that of the phone tested for

compliance approval and not related to the real EMR exposure in cockroaches.

(5) The authors have narrated increase/decrease in several tests in EMR-exposed cockroaches, but failed to correlate their significance in human health.

(6) They have extrapolated the observations made in cockroaches to warn humans, and this is far-fetched.

(7) It is impossible to replicate/confirm these observations by independent researchers using the information presented in the article.

In peer-reviewed scientific literature, there are all kinds of unrepeatable observations in animals, humans and their isolated cells exposed to EMR. Furthermore, there have been several misleading publications with unsubstantiated conclusions[3]. The expert groups of scientists who are reviewing the literature for international agencies like the International Commission for Non-Ionizing Radiation Protection, Institute of Electrical and Electronics Engineers and World Health Organization, are restricting the risk assessment of EMR exposure only to good quality publications with a separate list of weaknesses in the excluded publications. Public concern about the potential adverse health effects of EMR-emitting technologies is important and must be addressed with repeatable good quality investigations. The scientific outcome must be communicated in proper context by the researchers. The statements must not create unnecessary anxiety in the general public who are already inundated with unscientific and unproven information about the EMR emitted from mobile phones and base stations.

Overall, the study on cockroaches provides no useful information for the safety evaluation of EMR exposure because of the several weaknesses mentioned above. It is not possible to draw any meaningful conclusions related to human health and cell phone use to justify the warning.

1. Syalima, P. R., Raseek, R. and Evans, D. A., *Curr. Sci.*, 2017, **113**(12), 2275–2281.
2. Vijayalaxmi, *Mutat. Res*., 2016, **810**, 6–12.
3. Verschaeve, L., In *Microwave Effects on DNA and Proteins* (ed. Geddes, C. D.), Springer International Publishing AG, 2017, pp. 159–233; ISBN:978-3-319-50289-2.

VIJAYALAXMI

Department of Radiology,
University of Texas Health Science Center,
San Antonio,
Texas 78229, USA
e-mail: vijay@uthscsa.edu

Impatiens pendula B. Heyne ex Wight & Arn. (Balsaminaceae), critically endangered and endemic balsam of Western Ghats – a need for conservation

Impatiens L. are the most fascinating group of plants having ornamentally desirable flowers with varying colours and are often called 'jewel weeds' or 'orchid balsams'. Majority of these are annual herbs and a few are perennials. In India, the species are mainly concentrated in two biodiversity hotspots, viz. the Himalaya in the north and the Western Ghats in the south[1]. About 210 species of *Impatiens* have been reported from India[2], among which 106 are endemic to the Western Ghats[3]. Karnataka has 41 species of which 19 are endemic[3–7].

Impatiens pendula B. Heyne ex Wight & Arn. is a narrow endemic species (section Microsepalae) confined to the Chikkamagaluru district of Karnataka (Figure 1). This species was described by Wight and Arnott[8] based on the collections of Heyne and Rottler from Bababudangiri (*B. Heyne 4744*) and later in 1890 by Talbot (*Talbot 2370*) and in 1974 by Bhaskar (*Bhaskar 363a*) from the same locality. After a gap of 30 years, it has now been recollected from the temple surroundings of Mullayanagiri hilltop, an adjoining hill range of Bababudangiri[3]. The population of this species is restricted to the temple surroundings of the hilltop. A brief description of the species is given for easy identification along with notes for its conservation.

Taxonomy: *Impatiens pendula* B. Heyne ex Wight & Arn., *Prodr. Fl. Ind. Orient.* 1: 136. 1834; Hook.f., *Fl. Brit. India* 1: 455. 1874; Gamble, *Fl. Madras* 1: 101. 1915; Bhaskar, *Taxon. Monogr.* Impatiens W. Ghats 207. 2012.

Dwarf herbs, 10–15 cm tall, rooting at lower nodes. Stems with short internodes. Leaves are opposite–decussate at the base and alternate or subopposite towards the middle and tip, petiolate; lamina rhomboidal, leathery, reddish-green, sharply and distantly serrate, hairy and veins impressed on upper surface. Flowers 1 or 2, axillary, white or reddish, buds reddish; pedicels 5–8 mm long, red, hairy in a line, on portion facing petiole; lateral sepals two, minute, red, c. 2 mm long, glabrous; lip boat-shaped, spur less, with an yellow eye at the centre, margin and upper surface bristly ciliate; standard prominent c.5 mm long, wing petals c.5 mm long, velvety or villous inside, purplish-red near the mouth, white along margin or distal part, a minute dorsal auricle present. Stamens five, coherent above. Ovary c.2 mm long, hairy, green five-loculed; stigma sessile. Capsules c. 4 mm long, tomentose, two-seeded; seeds globose, rugose, brownish.

Distribution: Endemic to Chikkamagaluru district, Karnataka.

Specimen examined: India, Karnataka, Chikkamagaluru district, Mullayanagiri peak, 1875 m, 23 September 2011, *A.N. Sringeswara & Sahana 212* (UASB!)

Conservation status: This species is confined to less than 1 sq. km in the temple surroundings of Mullayanagiri hilltop at 1926 m, the highest peak in Karnataka. The region receives an annual average rainfall in the 1200–2600 mm range and remains cool throughout the year, an ideal condition for the species. The species occurs in open hilltop in association with *Thalictrum dalzelli* Hook., *Impatiens inconspicua* B. Heyne ex Wight & Arn., *Swertia* spp., etc.

The number of mature individuals of species was observed for three consecutive years; they showed extreme fluctuation