

A Centennial Reminiscence of the year '1924': Electrophysiology to Spiral-binding

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We are about to bid farewell to 2024. It is now receding, while the next is proceeding towards the shore. We are now at the trough of 2024, and its crest became a history now. Like annual rings within the stem of a tree, sea waves also seem to put signatures on the shore. Now we may attempt a deep learning of the autograph of temporal comber. Let us look into 1924, retrospecting a hundred years back.

1924 is specially remembered for the breakthrough in electrophysiology. The invention of ECG was honoured with the Noble prize in Physiology or Medicine in that very year. Also, EEG was tried on humans in 1924 itself. Let us have a brief retrospection to this aspect.

In 1924, Willem Einthoven of Netherlands received the Nobel prize in Physiology or Medicine for his phenomenal development of ECG.

First-ever endeavour to get into altered cardiac activities in disease was done by Alexander Muirhead at St. Bartholomew's Hospital, long back in 1872. He observed projectiles of radial pulsation through a stylus wrapped on the wrist of patients with fever. British physiologist John Burdon Sanderson later used Lipman's capillary electrometer to record such observations [1]. Augustus Waller at St. Mary's Hospital, Paddington, London in the first decade of the 20th century tried to understand the electrical activity of the heart through a specially designed apparatus. He used a projector attached with Lipman's capillary electrometer to project on a photographic plate, placed on a toy train, to get real-time projections of heart beats. It was conceptually the first ECG machine. Though in 1911, he realised that this device was not useful for clinical purposes [2].

Einthoven, in 1903, developed a string Galvanometer, more sensitive than Clement Adar's string Galvanometer of 1897. He used his own string Galvanometer to plot ECG of his patients. Despite having electrolyte-gel as of today, he used to soak the hands and feet of his patients in brine. He named different waves of an ECG as P,Q,R,S,T waves. He proposed a law, known as Einthoven's Law, to describe relationships among potentials across different limb leads [3]. For this outstanding contribution to electrophysiology of the human heart he was adored with the Nobel prize in Physiology or Medicine in 1924. Thus , 1924 has been marked as a golden year in the history of medical advancement.

Glory of 1924 does not culminate in this crescendo only. There remains another ground breaking invention in electrophysiology vis-a-vis in the history of medical inventions. EEG on humans by Hans Berger was also another blockbuster, occurred in the same year of 1924.

With the attempts by Kaufmann in Russia in 1912 to record experimentally induced seizures in animals under the guidance of Pavlov and Bechtnew, we got the first-ever EEG on curarised and craniotomised dogs. He studied spontaneous and evoked potentials extensively; and postulated that abnormal brain waves, verily different from spontaneous and evoked potentials, originated from the cerebral cortex during tonic clonic seizures. In 1912 and in Russia itself, Pravdich-Neminsky could record photographs of ECG; but this

facility was not available at Kaufmann's laboratory. In 1914, Cybulski and Jelenska-Macieszyna published photographs of EEG with localisation of paroxysms of abnormal waves during experimentally induced seizures [4].

Hans Berger, Professor of Psychiatry at University of Jena, Germany, acting as the Chairman of Neuropsychiatry there, was the first to record EEG on humans. He placed electrodes on the scalp over post-surgical calvaria-deficient areas. He used a double coiled string Galvanometer with a mirror to record images of reflecting beams of silver bromide coated paper, running at a speed of 3 cm/s. Carl Zeiss foundation sponsored the construction of a high amplitude vacuum tube to enhance the response at 125 Hz. With all this improvisation Berger could detect interictal EEG changes, and could demonstrate features of alpha rhythm; popularly known as Berger's wave. He continued his studies over the years, and in 1929, he published his historic article. Although Berger was nominated twice for the Nobel prize, Nazis blocked him for his anti-Nazi ideology. 1924 was thus marked as the year of human EEG in the history of medical marvels [4].

2024 will also be marked in the history of the medical fraternity in India owing to relentless protest against atrocities, uproars for transparency in health services and medical education systems, above all demand for justice. It has sparked in West Bengal, India following rape and brutal murder of an on-duty lady post graduate trainee at RG Kar Medical College and Hospital, a government-run MCH in Kolkata [5]. People at large feel it as their own issue, and get involved in these protest activities. It has been continuing since the second week of August this year. That raped and killed victim has been nicknamed as 'Abhaya' [6]. "Abhaya Manch" is now active all over the state to protest against all incidents of heinous sexual crime and murder. Initially it was a doctors' movement, now it has been turned into a people's unrest. Its duration and extent remind us of Vaikom Satyagraha, which occurred over 600 days a century back (1924-25). Mahatma Gandhiji also visited the then Travancore state to support that movement of people for reclamation of Dalits' rights to use public thoroughfare around a temple [7]. The ongoing movement has been un-dubiously supported by renowned Professor Abhay Bang, a Padmasree awardee medical faculty, in his inaugural lecture at NAPTICON, Pune recently. RV Ashokan, the National President of Indian Medical Association visited the long-run demonstration by junior doctors during their hunger strike in Kolkata to express the solidarity of medicos across India to their Abhaya satyagraha movement [8].

1924 was phenomenally a year of people's proclamation. Nobel laureate poet Rabindranath Tagore published his famous pro-toilers play "Raktakarabi" ("The Red Oleander" in English translation) in 1924 itself. And in 2024 Bengali intelligencia are celebrating centenaries of famous film directors Mrinal Sen and Rittwik Ghatak, eminent music director Salil Chowdhury, and distinguished poet Nirendranath Chakraborty, who devoted their excellent creativity for upholding the demands of toiling mass, and voice of the commons.

In 1924 the second-ever discovered galaxy, Spiral Andromeda, has come to our knowledge domain, and incidentally spiral binding of notebooks was first accomplished. Mankind advances spirally a long way with a definite linear transition over a century, which we can cherish now in this 2024 [9].

It is very fascinating to look back to the world as it was sparkling just one hundred years ago at a multitude of directions. Learned readers of MCMS might feel enchanted in celebrating a centennial of 1924, before beckoning 2025!

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