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The other effect

Two Nagpur scientists are trying to revive the Joshi Effect, a forgotten theory attributed to BHU chemistry professor Shridhar Sarvottam Joshi

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THE Nobel Prize-winning Raman Effect in physics is one of the most significant scientific achievements by any Indian scientist till date. But not many, particularly those outside the domain of regular science, know about another effect in physics discovered by an Indian chemist that has remained largely unexplored. Dating back to 1939, it is called the Joshi Effect, attributed to Banaras Hindu University (BHU) chemistry professor Shridhar Sarvottam Joshi (1898-1984).

A subject for over 300 PhDs across the world, the Joshi Effect hadn't been properly theorised until two scientists from Nagpur, Sanjay Wagh and Dilip Deshpande, decided to revisit it. After an arduous pursuit, they have come out with what they claim is the first proper theory explaining the effect. The two are awaiting the outcome of the submission of their paper to *Current Science*, but experts are already excited about their effort.

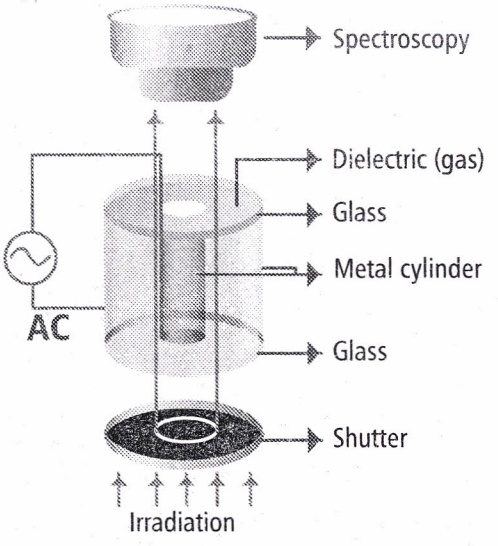
Says Chintamani Mande, former head of the Department of Physics, Nagpur and Goa universities, and a Fellow of Indian Academy of Sciences, "Their paper sounds good and the effort is laudable. After about five long decades, they have revived interest in the subject."

What is the Joshi Effect? Simply put, while the Raman Effect deals with the scattering of light passing through matter, the Joshi Effect demonstrates the effect of light on current generated in gas ionised by the application of voltage—a glow is formed due to current generated in a low-density gas ionised by application of voltage and when white light is thrown on the glow, the current, and, hence, the glow, get suppressed.

While the "light-extinguishing-light" effect is the negative Joshi Effect in so far as it is a suppression of current in low-voltage condition, there is also a positive Joshi Effect which is seen as current increase when high voltage is applied to concentric electrode plates coated with mercuric chloride, sodium hydroxide or potassium chloride.

Says Prof R M Singru, former professor of physics at IIT, Kanpur, and vice-president of the Maharashtra Academy of Sciences: "The work done by the two scientists is encouraging. The rekindling of interest in the Joshi Effect could open up new vistas of exciting applications hitherto unexplored."

Say Wagh and Deshpande: "The Joshi Effect had stopped evoking interest among scientists, especially after the discovery of the Opto-Galvanic Effect (OGE) (1976-78) by scientists from the National Bureau of Standards in the US that showed that apart from current, there are voltage changes too, unlike the Joshi Effect that dealt exclusively with current changes. What we have basically done is mathematically explain how the Joshi Effect happens."



(above) Experimental graphics of the theory proposed by Nagpur scientists Sanjay Wagh and Dilip Deshpande; professor Shridhar Sarvottam Joshi (top)

Wagh, who has a doctorate in physics, has done his post-doctoral research at the Tata Institute of Fundamental Research and the Harvard-Smithsonian Centre for Astrophysics, Cambridge. With research in theoretical astrophysics, image processing in astronomy, category theory and universal relativity under his belt, he is now the director of the Central India Research Institute (CIRI) in Nagpur. Deshpande, Director of P C D Institute for Computer Studies and Research here, has 40 research papers published in international journals on ferroelectric and thermal analysis. He has also authored many text books published by Oxford-IBH and Tata McGraw Hill.

Explaining the advantage of studying current changes, the scientists say that a current is formed due to electrons and ions generated in the gas ionised by voltage application. "When light is thrown on the gas, atomic electrons absorb the photons (light particles) forming a variety of meta-stable atomic states, thereby suppressing the current. Current and voltage change with each other but not in a linear fashion. So, information given by voltage changes will be different from that given by current changes. While voltage change gives information about the state of gas molecules excited by the throwing of a light beam, current change gives information about electrons and ions. This information is relevant since it shows how light affects the production of ions."

Wagh and Deshpande claim that they have, for the first time, mathematically explained that the Joshi Effect can also be obtained in a cylindrical metallic container with a transparent opening to pass the light through. Many scientists believe the Joshi Effect and OGE are similar. Among those who stress the similarities are Herb Broida of California University and H J Arnikar, former head of chemistry, Pune University. With OGE leading to a new application called opto-galvanic spectroscopy, interest in the Joshi Effect also got vastly reduced. Wagh and Deshpande say: "With current changes being explained and characterised as per our theory, we could also have Joshi Effect spectroscopy in future." The scientists are now devising an apparatus to demonstrate the effect all over again.