borewells which have become dry can be made to recover and start yielding water through such artificial means. In addition, surface water is polluted in most cases and indiscriminate attempts at artificial recharge of groundwater in the hands of the uninitiated poses the great danger of polluting one of the few sources of unpolluted water on the planet. Once groundwater becomes polluted, there is no way of purifying it. *Our plea therefore is to abandon all talk of artificial recharge and concentrate on promoting and accelerating natural groundwater recharge by means of adopting rainwater harvesting methods.*

Indiscriminate groundwater exploitation in metropolitan cities

Over-exploitation of groundwater through borewells in metropolitan cities poses a great danger. A resource of inestimable value is irretrievably lost through profligate use by affluent sections of the community at the expense of others less well-placed. Severe restrictions must be imposed on such exploitation. There is, at present, no regulatory authority exercising control on the utilization of groundwater and it is essential that licensing borewells and prescribing limits on water extraction be framed and introduced without delay.

Initiate a mass movement in rainwater harvesting

There is a vast extent of common land, generally classified as 'fallow' in village records, which must be converted into collection areas for rainwater harvesting. This is the only way of augmenting water resources for drinking and agricultural needs. Rainwater harvesting and groundwater recharge should be made to go hand-in-hand, with every member of the village community taking part in this effort. A mass movement in this direction is what is called for – (not the grandiose plans of politicians and bureaucrats of linking rivers) – which will solve local, state and national water shortages and make the land productive.

The sum and substance of the present analysis is to stress the inadvisability of sinking more borewells to greater depths for tapping water. The zone up to a depth of 100 m which contained fossil water accumulated over a period of years, has already been sucked dry and is no longer available for exploitation. Any talk of recharging this zone through artificial means is a doubtful proposition because of the extremely slow process of recharge.

Wake-up call for groundwater authorities

If groundwater exploitation is allowed to continue in the same reckless manner in which it has so far been permitted without licensing and controlling the extraction, the one and only safe source of water which nature had provided us as an insurance against poor monsoons will soon be irretrievably lost, landing us in a deep water crisis of national proportions with no way open to remedy the situation. Immediate action is called for to bring in uniformly applicable legislative measures all over the country, in setting limits to groundwater tapping and prevent in particular, the commercial exploitation of groundwater for profit-making. The earth sciences community has a special role in compelling the politician and the policy-maker to initiate urgent action in this regard for the sake of posterity.

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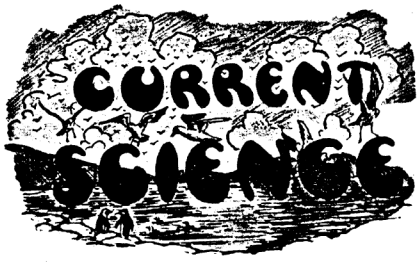
FROM THE ARCHIVES



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The physics of the diamond

By reason of its remarkable properties, diamond is a substance of extraordinary interest to the physicist interested in the study of solids. It exhibits in a characteristically striking fashion, many phenomena which are scarcely noticeable with other solids in ordinary circumstances. As an instance, we may recall the variation of specific heat with temperature. This was known as an experimental fact in the case of diamond for at least fifty years before it was recognised as a universal property of the solid state; the data for diamond published by Weber in 1875 formed the basis of Einstein's epoch-making paper of 1907 introducing the quantum theory of specific heats. History has a way of repeating itself, and the study of diamond should therefore appeal strongly to the experimenter seeking new avenues of research and to the theorist seeking new and fruitful lines of physical thought concerning the solid state.

For the reasons stated, I have since the year 1930 been deeply interested in physical investigations on the diamond. The difficulty of obtaining the material in a form suitable for exact studies has, however, been a serious obstacle to progress. Indeed, in the early days, I was reduced to the expedient of borrowing diamond rings from wealthy friends who, though willing to oblige, were slightly apprehensive about the fate of their property! More recently, these difficulties have diminished as the result of the discovery that flat plates of diamond of excellent quality are not very expensive and can be purchased in useful sizes from many jewellers in India. The collection of diamonds got together in this way has enabled studies with this crystal to figure prominently in the Bangalore researches on the solid state. Results of fundamental importance have been reached by spectroscopic investigations on light-scattering, on absorption in the visible and ultra-violet, on fluorescence and phosphorescence, and

by X-ray studies on numerous diamonds. It is no exaggeration to say that the experimental facts revealed by these researches have opened up a completely new view of the physics of the crystalline state.

My knowledge of diamonds in their natural condition has improved and my personal collection of material for study has been notably enlarged, following a visit by me to the State of Panna in Central India where diamond-mining and diamond-working have been carried on since ancient times. I carried with me to Panna, a microscope, a strain-viewer, an ultra-violet lamp and a small quartz spectrograph. With the aid of this apparatus and with the kind co-operation of Mr Balkrishna who is Director of Industries in the State, Mr Nayar and myself were enabled to examine several hundred diamonds in their natural condition. We were also graciously permitted by His Highness the Maharaja of Panna to examine his famous garland of 52 large diamonds strung together in their natural state as crystals. The 25 uncut diamonds I purchased and brought back to Bangalore form a representative collection chosen for their scientific interest. There is little doubt that their detailed examination will yield a rich harvest of results. . . .

It will be obvious from what has been stated above that the investigation of the physics of the diamond is full of promise for the future. I have made no reference in this article to further results of great interest which have been obtained but which could not appropriately find a place in a general account of the subject. I may, however, briefly mention the progress which has been made in the study of the relations between the spectroscopic behaviour of different specimens of diamond and the X-ray phenomena exhibited by the same specimens. It is sufficient here to remark that the results obtained in this connection do not in any way contradict the broad results stated above, but on the other hand afford them the fullest support.

C. V. RAMAN