

that when the incident light vibrations are along the normal to the molecular plane there is hardly any absorption and that only vibrations in the plane are absorbed. P. Jordan has contributed an interesting article *Über Biologische Wirkungen Ultravioletter Lichtquanten*, in which he shows that a phenomenon akin to Raman effect is taking place in the interaction of light and matter in biological media. In his theoretical paper on *Some Remarks on Reciprocity*, Max Born presents in a very general form, the difficulties which theoretical physics encounters when dealing with the nature of light and ultimate particles. An attempt to examine the diminution of optical anisotropy of molecules of a liquid due to the influence of neighbouring molecules is made by B. S. Madhava Rao and K. Venkatachala Iyengar in their mathematical paper on *An Inequality Concerning Lattice Sums*. Of the three papers on supersonics,

N. S. Nagendra Nath gives a theoretical treatment of the *Diffraction of Light by Supersonic Waves*, in which he points out an extreme case where one can get closed expressions for the intensities of diffraction orders. E. Hiedemann and K. Osterhammel have a paper on *Untersuchung von Schallamplituden-Feldern Mittels Einer Methode der Isochromaten*, in which a method of colour photography is described for the demonstration and the determination of energy distribution of sound field with white light. In his paper on the *Dispersion of Ultrasonic Velocity in Liquids*, R. Bär reports failure to observe any dispersion of velocities in benzene and water for a range of frequencies 7.5 and 52.5 MHz.

The volume is priced at Rs. 6 or 10sh. per copy.

B. S. M.
C. S. V.

The Central Board of Irrigation in India

THE recent publication of the Central Board, *Annual Report for the year 1936-37*, not only gives the public an idea about the work that the Board is carrying on, but shows what different provinces of India are doing by way of research on problems of Irrigation. The Board provides facilities for workers from different provinces to meet together once a year and to compare notes. As its President Mr. G. M. Ross said in one of these meetings, "This annual meeting affords a splendid opportunity for Irrigation Engineers from various parts of the country who are particularly interested in research, to discuss both formally and informally, the many problems that beset irrigation engineers not only in India, but in other irrigating countries of the world. By constructive criticism of the various experiments in progress in these provinces which have Research Stations and discussion of other problems of common interest, we are afforded the best possible means of applying the combined knowledge and experience available in the country to those problems which are so important to the many million engaged in cultivation aided by irrigation. You are aware that India has a much greater area under irrigation than any other

country in the world and in fact, it is equal to the total area irrigated by the next five leading countries including America".

Of the various subjects discussed in the Research Officers' meeting of the Board, the following appear to be of all-India importance:—

- (1) The Role of Reservoirs in River Flood Control.
- (2) Meandering of Rivers.

Discussion on these two subjects seems to have lead nowhere. It is true very little information is available about them but that is no reason why efforts should not be made to study these problems. Much of the prosperity of the country depends on flood control. During recent years we have witnessed catastrophic floods all over the country and thousands of lives and hundreds of villages have been washed. It is time that something substantial is done to increase our knowledge about these two subjects so that we can grapple the problem more effectively. A River Commission on an all-India basis is what is called for—where engineers from different provinces and a few scientists may sit together and devise means to combat the evil.

The work that is being carried out at different research stations will now be reviewed.

PUNJAB

In the Punjab, Irrigation Research is carried on under the direction of the Director, Irrigation Research. Besides the laboratory at Lahore, he has a River Model Laboratory at Malikpur and a number of silt laboratories at the headworks of various canal systems of the Province. The following problems appear to be of more than local interest.

It is well known that cavities do form under weirs or similar hydraulic structures and many disastrous failures had been due to these. It is a very vital problem to the irrigation authorities to prevent, if possible, or to detect the formation of such cavities below weirs. Punjab research workers seem to have been fully alive to the dangers of this problem and we find them busy with the following researches:—

1. *Design of Weirs on Sand Foundations.*—In this experiment, mathematical, experimental and field workers have combined and succeeded in replacing Bligh by a much sounder method of design. It is hoped that this method will be successful in preventing the formation of cavities below weirs. But for existing weirs it is necessary to detect defects under them.

2. *Cavities under Weirs.*—During the year under review, an investigation has been in progress to determine whether it is possible to devise a method for detecting defects and cavities under weirs. The principle employed is that wireless waves are partially reflected from any surface of discontinuity and when coming from different distances would reach an aerial in different phases. The composite reflected wave can be analysed by means of a cathode-ray oscillograph operated with a high frequency time base and from the nature of the reflection it is possible to infer defects.

3. *Effect of Silt and Temperature on Discharges.*—It is a common belief among irrigation engineers that the silt content and temperature of flowing water affect the discharge as measured by rectangular or a broad crested weir. For this purpose an experiment was set up in which the discharge in a flume was measured by current

meter, a rectangular weir and by a measuring tank. It was possible to have all shades of water from clear to grey, brownish grey and then finally brown. A range of water temperature from 12° C. to 25° C. was also met with. Reynold's Number (R_v) for these experiments was above 10^5 . Discharges in the rectangular weir were calculated by Rehbock's formulæ.

The experiments shewed that within the limits of experimental error variation in the temperature and silt content of the water did not produce any appreciable difference in the discharge measured by a rectangular weir and the velocity meter.

CENTRAL STATION

Central Hydrodynamic Research Station at Khadakavasla near Poona

Experiments at this station had been mostly on Falls and on Rivers. Various types of falls had been tested at their station. Of these, the following are some of the well-known ones:—

1. Proportional standing wave flume meter fall with sides downstream of the fall diverging at 1 in 10, 1 in 5.
2. Proportional standing wave flume meter fall with curved divergences downstream.
3. Weir falls—free over fall type.
4. Weir falls with glacis, cistern of arrows and control blocks.
5. Weir fall with glacis, baffle, bowed cistern and deflector.
6. Notched Falls.

Notched falls (Punjab type) were more costly than any other design and also gave inferior results, so may finally be discarded.

The flume fall with friction block according to a design by Mr. Montagu was about 7 per cent. more expensive than the standard flume fall design.

The choice would then lie between a Plain Weir or a weir with downstream glacis slope and

- (a) arrows and control blocks, or
- (b) baffle and deflectors.

These experiments have shown that the latter are cheaper and better.

Experiments with large-scale model of the Gauges at the Hardings Bridge (the horizontal scale = 1/500) on effect of length of guide banks on flow (for the Railway Board)

The Hardings Bridge Committee at their meeting in November 1935 decided that the guide banks of the Hardings Bridge, which are 2,850 ft. long = 0.53 times the length of the bridge should ultimately be extended to 5,385 ft. the length of the bridge. The experiments were done with both Right and Left Guide Banks extended equally, Damukdia Guide Bank being removed.

The conclusion was that Sir Francis Spring's design should be adopted.

BOMBAY

This station does not now deal with hydraulic problems. It is more concerned with soil research.

1. *Soil Type in the Deccan Canal tracts and their behaviour under irrigation.*—It comprises the study of typical soil profiles, the physico-chemical changes caused by irrigation and high subsoil water levels and the reclamation of soil tilth of damaged lands after drainage.

Similar work seems to have been done at the Padigaon Sugarcane Research Station by Dr. J. K. Basu and M. S. S. Sirur.¹ It will be interesting to compare their conclusions.

UNITED PROVINCES

The following results are of more than local interest:—

1. *Treatment of canal beds with molasses.*—For staunching canal beds sugar factory bye-products were used but no successful results seem to have been obtained.

2. The correlation coefficient between the discharge of the Ganges River below the

off-take of the Ganges River at Headwork and at Narora have been worked out for the month of December to May inclusive, for the years 1929-30 to 1935-36.

The conclusion stated mathematically is that if discharge of the Ganges River at Narora be taken as a function of several variables, this function is independent of discharge of the Ganges River at Hardwar in dry weather month. This conclusion seems to be surprising and requires more thorough examination.

SIND

During the current year the work of the Development and Research Division was carried out under the following heads:—

1. *Model experiments.*—Various models on regulators and falls were experimented upon.

2. *Collection of Hydraulic data on Barrage Canals.*—Out of 74 sites with discharge varying from 20 to 10,000 cu/sec. only about 22 sites had a fairly steady bed as seen from the observations of the last four years. From these 22 sites only 3 sites satisfy Lacy's two criteria, viz., $P_w = 2.67 Q^{1/2}$ and $V = 16 \sqrt[3]{R^2 S}$ within 10 per cent. and as such no conclusion could be drawn from the data.

Instead of rejecting these data of 22 sites as being untrustworthy because they do not satisfy Lacy's equation, it would have served the cause of science better if Sind had tried to develop their own relations from them.

No new station has been opened in any other provinces since the last report of 1935-36 was out. It is time that provinces like Bengal, Bihar, Orissa and Madras should have their own stations. If they cannot afford to have a separate station each, Bengal, Bihar and Orissa whose problems are more allied in nature and interconnected, may have a common research station at a central place.

¹ See "Soils of the Deccan Canals—I. Genetic Soil Survey and Soil Classification. Nira Right Bank and Prarara Canals", *Indian Journal of Agricultural Science*, Oct. 1938, 8, Part V.