The work of the aëronautics division has made good progress; in particular the study of the best forms of aëroplane surfaces, and of the distribution of flow round such surfaces, has been greatly advanced. An opportunity of describing this work will arise later, on the issue of the annual report of the Advisory Committee for Aëronautics.

The metallurgy department was occupied for some considerable time during the autumn with the transference to the new Wernher building. The principal item of research work has been the investigation of the aluminium-zinc alloys, carried out for the Alloys Research Committee of the Institution of Mechanical Engineers.

Mr. Baker, the superintendent of the William Froude National Tank, has carried out a number of investigations, some of which have been already described in these pages. Careful comparisons have been made with Mr. Froude's results at Haslar by tests on models to lines supplied by him, and experiments have also been carried out with a model similar to others tested at Clydebank and Washington. These tests have shown satisfactory agreement, and the national tank is now ready to go forward with general experimental investigations of ship resistances.

In this short summary it is impossible to do more than touch on the many points of interest presented by the work of the laboratory. Enough, however, has been said to show that the laboratory continues fully to justify the appreciation which the great manufacturing firms of the country have displayed of its value to industry.

OZONE AND VENTILATION.

THE Journal of the Society of Arts of February 9 contains a paper by Messrs. Leonard Hill and Martin Flack on "The Influence of Ozone in Ventilation." The authors point out that whilst it is not legally permissible for the carbonic anhydride in the air of a factory to exceed a few parts per 1,000, no harm whatever is caused by breathing air containing up to 4 per cent. of this gas. A similar statement applies to deficiency of oxygen, which does not become important until the proportion falls to 14 or 15 per cent. These conclusions are quite in accord with the fact that, on account of the dead-space separating the lungs themselves from the open air about one-third of the air drawn into the lungs is re-breathed; it is thus quite impossible that a few parts per thousand of carbonic anhydride in the outside air should affect the lungs, in which the percentage is normally about 5 per cent.

Another theory of the ill-effects of bad ventilation is the supposed liberation of organic poisons. This also is probably fictitious, as animals will live and thrive when supplied exclusively with air already breathed by other animals, and containing $3\frac{1}{2}$ per cent. of carbonic anhydride; they are liable to die of suffocation if the air supply is interrupted, or if the percentage of carbonic anhydride rises to 10 to 12 per cent. As an explanation of the discomfort arising from lack of ventilation the authors suggest: (1) the stagnation of the air, resulting in diminished evaporation from the skin, and a consequent sensation of lassitude; (2) the nausea caused by the odour emitted from an imperfectly washed crowd. The value of ozone in ventilation depends largely upon its power of removing this odour; sterilisation is perhaps less important as expired air is practically sterile; infection is conveyed by droplets of saliva, which cannot be removed by ventilation, but soon settle, and may be removed when the room is dusted.

LA HOUILLE BLANCHE.[1]

THE work of the French "Direction de l'Hydraulique" has already been the subject of two articles in these columns (May 7, 1908, and November 25, 1909). On both occasions a tribute was paid to the very effective and thorough manner in which the department was carrying out its systematic investigation into the hydraulic reserves of the mountain ranges of France. The volume now under review is the fourth of the series, and it sustains the favourable impression created by its predecessors. It brings the record of observations down to the end of 1910, completing a period of very nearly eight years since the inception of the department. The service, in so far as it relates to the region of the Alps (which is the only range at present under observation, though the extension of the work to the Pyrenees is impending), is now concentrated under the direction of M. R. de la Brosse, whose former coadjutor, M. R. Tavernier, has become Inspecteur général de l'Hydraulique agricole.

The area of country comprised within the purview of the inquiry amounts to 22,000 square miles, and lies immediately to the south of the Lake of Geneva, extending to the shores of the Mediterranean, and being bounded on the east and west, respectively, by the Italian frontier and the river Rhone. The principal basins are those formed by the tributaries of the Rhone on its left bank between Geneva and the sea, the most noteworthy being the Isère, the Durance, the Var, the Arve, and the Dranse. Gauging stations to the number of 180 have been established in suitable localities, and the total number of gaugings carried out to December 31, 1910, was 3116, of which 726 represent the work of the last twelve months. The greatest number of records taken at any one station amounted to fifty-nine, and the mean for the whole was seventeen.

From the observations two factors, or coefficients, have been deduced. First the mean characteristic discharge, which represents the minimum guaranteed for half the year; and, secondly, the modulus, or arithmetical mean of the discharges corresponding to the daily level. The former of these factors is valuable in computing the industrial trustworthiness of a stream, and the second is an important element in connection with regularisation works. As an instance may be taken the case of the Durance at Rousset, where, during the five years 1905–9, the records show a variation in discharge between 18 and 440 cubic metres per second, giving as mean figures for the whole period a low-water discharge of 20 cubic metres per second, a modulus of 68, and a total annual volume of 2,138,000,000 cubic metres. The mean characteristic discharge, *i.e.*, the minimum on which it is possible to reckon during half the time, is about 46 cubic metres per second.

The motive power in the French alpine region actually harnessed at the present time amounts to 473,000 h.p., dvided approximately as follows:—Metallurgy, 210,000; power and light distribution, 155,000; chemical products, 60,000; paper, cardboard, &c., factories, 30,000; electric traction, 10,000; miscellaneous, 8,000. Other schemes are now projected which will shortly raise the total to something in the neighbourhood of 2,000,000 h.p.

The volume contains one or two useful essays by individual contributors on technical matters connected with the taking of observations, and there are several interesting photographs. Then follows part ii., which

1 Service des Grandes Forces Hydrauliques (Région des Alpes). Compte Rendu et Résultats des Études et Travaux au 31 Décembre, 1910. Tome iv., pp. 556. Annexe i., Cartes. pp. 14+8 cartes; Annexe ii., Nivellements, 33 planches. (Ministère de l'Agriculture, Direction de l'Hydraulique et des Améliorations Agricoles, 1911.)

constitutes by far the bulk of the work, being a tabulation of the numerical readings taken at successive dates throughout the year at the different stations.

There are two "Annexes." The first is a series of charts showing the disposition and extent of the various factories and works where hydraulic power is turned to account, and the second is a series of longitudinal sections, or profiles, of the watercourses of the Isère and the Arc.

All are admirably prepared, and give rise to the reflection that some things are done much better abroad than they are at home. Our own country stands out in "splendid isolation" in possessing no hydrological service and in making no official attempt whatever to catalogue, define, and conserve her natural resources of water power and supply, now running to waste or liable to misappropriation. In this attitude she finds no sympathy or support from her neighbour across the Channel, nor from the United States, nor Italy, nor Switzerland. Each of these countries has realised the advantages accruing to trade, agriculture, and the public welfare generally from a systematic development and control of La Houille Blanche.

POETRY AND SCIENCE.

THE Professor of Poetry at the University of Oxford, Dr. T. Herbert Warren, President of Magdalen College, gave a public lecture on March 2 on the subject of "Poetry and Science." He began by quoting his predecessor Matthew Arnold, who wrote on New Year's Day, 1882: "If I live to be eighty, I shall probably be the only person left in England who reads anything but newspapers and scientific publications."

Has Matthew Arnold's gloomy prophecy been fulfilled? Have newspapers and science killed real literature? In particular, are the interests of science hostile to the interests of literature?

Where science has dominated, has poetry languished? This is a very burning question, for science has certainly made great advances. It impresses the man in the street, chiefly by its usefulness. It is the poet and the poetic person who are impressed by the marvel, the magic, and the mystery of science. Matthew Arnold inherited the tradition of Wordsworth, who was a great poet of Nature, but not a poet of Natural Science. He strove hard to do justice to it, both in his prose prefaces and in his poetry, but with imperfect success. Wordsworth's poem "The Poet's Epitaph" contains a most beautiful and memorable description of the poet, but is scarcely fair to the man of science, who is generally a man also of natural affections. The man of science may be as fond of his mother as the poet, who is often one of the most selfish of beings, and if he would not "botanise upon his mother's grave" because he knows no botany might be quite capable of turning her into copy.

Further, the poet is not "contented to enjoy the things that others understand." He must synthesise in his own way. Wordsworth himself was for ever philosophising and moralising.

Keats, again, is often cited as complaining that Newton had destroyed the beauty of the rainbow by reducing it to prismatic colours, but Keats was perhaps not serious in this charge.

Goethe, on the other hand, did not object to Newton for reducing the rainbow to prismatic colours, but only for doing so wrongly.

Matthew Arnold "poked fun" at science as he did at religion, and was even less willing to treat it seriously than religion. He was often exceedingly amusing, and his famous description of a scientific education in "Friendship's Garland" was highly so.

Darwin, who began by being a great lover of poetry, thought that in later days he had lost the power through atrophy, but in point of fact the atrophy was by no means complete. He remained a most poetical writer. The closing paragraphs of the "Origin of Species" were worthy of Lucretius, which they strongly resembled.

History shows that poetry, philosophy, and science had all begun life together as children of one family. The early Greek poets, like the authors of the Books of Genesis and Job, dealt with the origin of things and the Story of Creation. The early thinkers who succeeded them expressed their thoughts in verse, and were often highly poetical. What could be more poetical than the "dark" science of Heraclitus? The same relation was maintained through Greek literature. The greatest astronomer of antiquity, the inventor of the Ptolemaic system, was the author of a beautiful epigram which was truly poetic. From Greece and Alexandria, science and poetry passed together to Rome, and might be found combined in Lucretius and Virgil. The greatest singers of antiquity were the most alive to science. Modern literature shows the same phenomenon in Dante and in Milton and in Tennyson. This is specially well brought out in a book by a living man of science, Sir Norman Lockyer's "Tennyson as a Student of Nature." On the last of the three poets Sir Oliver Lodge has also written briefly, but with rare force, in the recent volume "Tennyson and his Friends."

As time has gone on, the scientific spirit has increasingly made itself felt in poetry, and may be seen in the works of F. W. H. Myers and his brother, in the late Duke of Argyll, in George Romanes, in Richard Watson Dixon, and still better in his friend and editor, Mr. Robert Bridges. And others of the earlier poets had also been acquainted with science, notably Gray and Shelley.

With regard to the greatest of all, if Bacon wrote Shakespeare it is odd that Bacon's science does not appear more often in the plays, but in any case it may be remembered that Bacon wrote poetry of his own and had a place in the "Golden Treasury."

Other lands and literatures too have had their scientific poets, the most famous being Goethe, of whom the best account is to be found in the popular lectures of a most poetical man of science, Helmholtz. I can speak at length only of one, the French poet of the last century, Sully Prudhomme, who combined science, philosophy, and poetry. The best account of him is to be found in the study by M. Zyromski. "Poetry," said Sully Prudhomme, "is not only the lyrical outburst of our sentiments. The great poetry has noble destinies, and will sing the conquests of science and the synthesis of thought."

The average man does not care for "great poetry," or only for that part of it which appeals directly to his own feelings. Just now, what Sully Prudhomme calls *lyrisme*, that is, personal poetry, holds the field, but that has not always been so, and will not always be so. Science has not destroyed poetry. Cambridge, the University of Science, has been the University of Poetry, and with the revival of Science at Oxford in the last century, beginning in Shelley's time, poetry revived too. The really great poet must respond to the main and moving interests and influences of his day. The old facts and factors, the old *motifs*, do not change. Rebekah at the Well, David's lament over Saul and Jonathan, Hector and Andromache, Catullus at his brother's grave, still move us. But while these remain, our outlook on the world does gradually change, as Sully Prudhomme foretold in his fine sonnet to "The Poets of