heating installations, and in ensuring circulation troubles due to gas-blocking and blockage of pipes by sludge. Some research was undertaken for improving products manufactured to the Council's specifications, such as a laundry powder for white work at large laundries and a detergent for use in washing-up machines. The assessment of traffic noise has become a principal task of the Physics Section.

MANAGERS AND SHOP STEWARDS

A FURTHER occasional paper from the Institute of Personnel Management, which is entitled *Managers and Shop Stewards**, gives a balanced but concise account of the problems presented in industry by the rise of the shop steward—a phenomenon which reinforces much of the argument to-day for more attention to management and industrial training generally, including the education of the shop stewards themselves. There are also ample notes and references.

In the first chapter, Mr. Marsh reviews the growth of workplace bargaining as he describes the essentially domestic issues of a works or factory with which the shop steward is concerned, pointing out that the shop stewards as we know them to-day, except in the printing industry and in some engineering firms, date only from the early 1940's. He explains the work of the shop stewards and the inevitability of some form of workplace bargaining, quite apart from outside agreements, for managements which desire close relations with their workers on a domestic basis. In the second chapter he discusses the advantages and disadvantages which workplace bargaining presents for the Unions and the solutions which the Trade Unions could offer. He points out that, in Trade Unions, rules and discipline are not related in any simple way and that Unions rules form only part of the system of regulations under which shop stewards operate; other kinds of rules may be more important than those provided by the Unions themselves. Both Unions and employers are conscious that the greatest force for control within any Union is not the rules themselves but the relation of workplace representatives with full-time officials, and Mr. Marsh insists that while there can be strong Unions there cannot be good relations without good employers.

Mr. Marsh then examines in his third chapter the advantages and problems of workplace bargaining for management and the solutions which management could offer, stressing particularly that management should show more initiative in this field to ensure that the rules under which bargaining is conducted are understandable and predictable. Finally, in his last chapter on the future of workplace bargaining, he considers the challenge which the evolution of this system presents, the reasons which have led both Unions and employers to favour the growth of educational provision for both management and shop stewards in the field of industrial relations in the workplace. This he regards as a major challenge to the teaching capacity of managements, Unions, technical colleges and extra-mural educational bodies like the Workers Educational Association and the universities. While that is a long-term contribution, the heaviest and primary responsibility lies with management, not because managements are often wrong, but because they cannot afford the luxury of 'not being right', and Mr. Marsh suggests in conclusion that the responsibilities of managers under workplace bargaining are so onerous that they would be wise to act as if it were true that managements get the shop stewards they deserve.

* Institute of Personnel Management. *Managers and Shop Stewards*. By Arthur Marsh. Pp. 40. (London: Institute of Personnel Management, 1963.) 7*s*. 6*d*.

LEARNING TO READ

THREE papers recently published in *Educational Research* (6, No. 1; November 1963. Published for the National Foundation for Educational Research by Newnes Educational Publishing Co., Ltd.) deal with the concept of reading readiness which has prevailed in English-speaking countries over the past few decades, during which it has been widely held that a child is not ready to learn to read until he has attained a mental age of about 6½. A. E. Sanderson feels that this concept is in urgent need of re-examination since nation-wide literacy is possible only in an environment exerting social and economic pressure on children to acquire and use reading habits and skills. The concept implies that children reach the stage of reading readiness at different chronological ages, and that the teacher is in a position to give individual attention to each child. On the other hand, the risk of frustration and of the development of actual resistance to reading can be avoided by not pressing children to begin too soon.

If reading readiness depends on mental age, some kind of test would seem to be necessary to establish it in the case of each child. In the classroom, however, that is impracticable, and most teachers say that they know by 'instinct' when the appropriate time has arrived. In this respect, indications suggest that parents are taking less interest in their children's reading than in former times: even so, clashes between schools and parents' ambitions for their children are by no means uncommon, while the best results are obtained when there is active co-operation between school and home.

R. Lynn relates reading readiness to the process of mental maturation, which, in the minds of many people, is a biological phenomenon that cannot be speeded up; and a good many observers hold that before the mental age of 6–8 a child is capable of recognizing simple outline figures but not matters of detail. Lynn considers that statements like these underrate children's capacity for perception, particularly since it has been shown that they can distinguish between nonsense letters, like squares, triangles and irregular shapes, at a mental age of 4–4½. He quotes a number of cases of children who have taken the first steps in reading as early as 16–18 months, the record for this apparently being held by Francis Galton, who could recognize all the capital letters when only one year old. In two of these cases, however, the children lost interest in reading soon after they had begun.

A fairly common difficulty which children experience is in distinguishing between reversals (*n* and *u*) and between mirror images (*d* and *b*). It has been shown that certain animals, such as rats and octopuses, have trouble of the same kind. With children, there is some evidence that this problem may be capable of solution through practice under suitable care.

To J. A. Downing the question, *should* we, is separate from that of *can* we teach children of young age to read. He believes that the problem-solving schemata of

learning to read comprise only part of the complex of factors which constitute general intelligence, and he quotes results of experimental tests showing that the age at which children begin to read is influenced by the teacher and classroom atmosphere as well as by their parents. To him, reading is a 'decoding' operation which is simpler in a language like Finnish, in which there is a consistent relation between the code and its phonemes, than in English with its multitude of ambiguities and complexities. In some other languages, orthographies present a different set of problems.

To meet difficulties of this kind, a new code called the Initial Teaching Medium has been devised, which is based on an alphabet and spelling simpler than the medium in which most beginners' books are printed. Its advantages are that it contains fewer ambiguities, it is less complex, in reading it the eyes move continuously from left to right, never having to reverse, and there are fewer items to be learned for phonemes and whole words. Working with the Initial Teaching Medium, children can begin to read earlier; in other words, reading readiness is related to the complexity of the reading code.

Learning to write is an 'encoding' process distinct from learning to read. Not only does it depend on the co-ordination of a different set of muscles for working with pencils or crayons, but it involves the mastery of an orthography distinct from that which is used in print. Downing refers with favour to developments in the Responsive Environments Laboratory of Yale University, where O. K. Moore is attempting to by-pass some of these difficulties by encouraging children to use ordinary electric typewriters as well as a computer-controlled 'talking' typewriter which can 'talk back' to the child. It has been found that children between 2½ and 6 years of age can use the ordinary keyboard, and that they enjoy the experience. Moore emphasizes that as children learn to type they ought to master the elements of punctuation, which are also part of the encoding system; and Downing suggests that a simple design of typing machine, capable of reproducing 43 letters of the augmented alphabet used in the Initial Teaching Medium, could be mass-produced cheaply, and that under school conditions machines of this kind could be made available for use along with paper, pencils, crayons and ink. Then they might help to bring a child's reading and writing into line with his listening, speaking and thinking.

Taking the three papers together, one is impressed by the importance and diversity of the issues on which they touch, yet at the same time by the slight amount of attention which is being directed to them in the British Commonwealth, or indeed, apart from the United States, in any part of the world. In our present-day civilization, communication holds a central place. Immense advances have been made in the development of new media, like the telephone, cinema, radio and television, but so far, little has been done to bring the older, traditional forms, including the structure of language, the alphabet, spelling, the shape of letters, and along with them, reading and writing, and even speaking, up to date. These are points of cardinal importance in relation to what is destined to become the premier language in the world. Then, of course, there is the question what people read after they have become literate; but that problem brings up other considerations.

R. Weatherall

THE NETHERLANDS REACTOR CENTRE

TWO illustrated brochures in English have recently been issued by the Netherlands Reactor Centre (Reactor Centrum Nederland). The first * gives a general survey of the reactors *HFR* (high-flux reactor), *LFR* (low-flux reactor) and *KRITO* (critical experiment reactor) at the research establishment at Petten and of the research carried out by the various departments, and the second † is a summary of the activities of the Centre during the period January 1, 1962–June 30, 1963, together with financial details for 1962.

The Reactor Centrum Nederland, a foundation set up on July 6, 1955, consists of a Board of Governors of forty members and a Board of eleven members, representing the Netherlands Government, the electricity producers, a number of Dutch industries, and the Foundation for Fundamental Research on Matter, which is the body mainly supporting nuclear research in the Dutch universities and colleges. The chairman of both Boards is Dr. E. L. Kramer.

The reactor *HFR* became critical for the first time during November 1961, but the reactor tank was found to have defective welds and a new tank was installed during February 1962. The power was then gradually increased to the 20 MW for which the installation was designed. In November 1962 the reactor was transferred to Euratom to become the principal installation of the new Euratom research centre adjoining the site of the Reactor Centrum Nederland at Petten. The agreement between the Netherlands Government and the Euratom Commission stipulates that for the first four years at least the *HFR* will be operated for Euratom by the Reactor Centrum Nederland and that the Dutch irradiation programme will have priority so far as this reactor is concerned.

The Enrico Fermi Building for Experimental Reactor Physics has been completed and houses the 10-kW 'Argonaut' type reactor *LFR* and, in the closed concrete hall which forms part of the north wing of the building, the reactor *KRITO*, which became critical on March 28, 1963. *KRITO* is a zero-energy reactor, designed by the Reactor Centrum Nederland and built entirely by Dutch firms, and is an important part of the *NERO* reactor development programme carried out in association with Euratom. The programme comprises experiments for the development of a 61-MW (thermal) pressurized water reactor suitable for ship propulsion. The Reactor Centrum Nederland has collaborated with a German industrial combination interested in the design of an advanced pressurized water reactor for the German experimental nuclear vessel and has taken part in the Netherlands working group studying a 52,000-ton tanker equipped with a pressurized water reactor. This investigation was one of three—the others in Scandinavia and France—for the European Nuclear Energy Agency of the Organization for Economic Co-operation and Development.

The Evaluation and Design Department of the Reactor Centrum Nederland has been concerned with three research reactor projects. The first was *BARN* (*B*iological *A*gricultural *R*eactor *N*etherlands), a 100-kW swimming-pool reactor, built at the Institute for the Application of Atomic Energy to Agriculture, near Wageningen. The fissile material is 3,400 g 90 per cent enriched uranium. Water is both moderator and coolant, and the reactor, which became critical on April 9, 1963, has two irradiation channels and a thermal column. The second project was that of *ECO*, a critical experiment to be installed at the Euratom establishment at Ispra, and the third, a small research reactor of the 'Argonaut' type designed for the Technological University at Eindhoven.

* *The Research of Reactor Centrum Nederland, General Survey of Activities*, 1963. Pp. 35. Issued by External Relations, RCN (August 1963).

† Reactor Centrum Nederland. *Summary of Activities*, January 1962–July 1963. Pp. 16. (The Hague: Reactor Centrum Nederland, 1963.)