

ing solutions to prevent bunt, smut and so on in cereals, the work of John Curtis in dealing with insect pests and the work of Miss Eleanor Ormerod as entomologist to the Royal Agricultural Society of England.

The final paper of the conference, "Labour Supply and Harvesting Techniques in Britain, 1790-1880", was read by Mr E. T. Collins of the Museum of English Rural Life. He described the progressive development of the hand tools used in reaping from the toothed sickle to the sickle with a plain cutting edge—the result of increased knowledge in the tempering of steel—and thence to a much heavier tool known as the bagging hook. The scythe was also used for cutting barley and perhaps oats and rye. With the coming of the bagging hook, much more rapid work was possible in cutting wheat, and Mr Collins argued that some of the delay in adopting the horse-drawn reaping machine was a result of greater efficiency of the developed hand tool. It was only when migratory labour became scarce, and casual help by tradesmen and others from the towns gradually declined, that farmers were more or less forced to adopt the new machines, some of which were liable to inconvenient breakdowns. Possibly, too, the labourers did not react to their introduction very enthusiastically.

Ergonomics Research

from a Correspondent

REPRESENTATIVES from Canada, France, Holland, India, Italy, Japan, Sweden, Switzerland and the United States were among more than 160 delegates who attended the recent annual conference of the Ergonomics Research Society at the University of Sussex from March 27 to 29.

Most of the papers presented at the conference dealt with six main topics—heat stress; personal equipment and clothing; vehicle simulation for training and research; vibration; human performance under water; and decision making in complex remote tasks.

Papers on heat stress were read by speakers from the Royal Aircraft Establishment, the US Army Research Institute of Environmental Medicine, and the British Iron and Steel Research Association, on industrial heat problems and the qualities and characteristics of air-cooled and water-cooled protective suits. Other types of protective clothing, such as outdoor building site garments and respirator masks and the sizing and special construction of tropical aircrew garments, aroused considerable discussion.

Vehicle simulation for training and research, an important area of research in view of increasingly high speed air and road travel, provoked lengthy discussion of papers given by delegates from British Rail, British European Airways, the Wellcome Foundation and the Royal Air Force Institute of Aviation Medicine. The information given emphasized simulation for diesel locomotive and airline training and for driver performance particularly of racing cars.

One of the problems of high speed travel, particularly in the air—the extraterrestrial environment in which ergonomics is bound to play an increasing part in the future—is that of vibration and its effects on man. Both the effects of vibration and research to isolate man from it were described by speakers from the Royal Aircraft Establishment and the Universities of Birmingham and Aston in Birmingham.

Man is equally determined to explore the underwater environment. The difficulties of movement and operation under water, and apparatus and techniques to improve man's performance under such conditions, were outlined by speakers from the Royal Naval Medical School, the Boeing Company of America and the RAF Institute of Aviation Medicine.

A difficulty confronting man in his continual search for control over his environment, whether terrestrial, aquatic or aerial, arises from the increasing necessity to exercise control remotely. Problems of man/computer communication in process control, with special reference to the steel industry and hospital management, and the mental load imposed on operators of railway signal boxes, were discussed under the topic "Decision Making in Complex Remote Tasks".

Ergonomics is too multi-disciplinary an area of research and interest to be confined to half-a-dozen topic headings, and the discussion covered an ergonomic assessment of current tower crane operation, a concurrent driving and telephoning task, analysis of the skills practised and required in our changing machine technology, Japanese research into the ergonomics of vision and the relation between anthropometric dimensions and the preferred heights of kitchen work surfaces.

Organometallic Chemistry

from a Correspondent

A PRINCIPAL theme in the symposium on recent progress in organometallic chemistry at the annual meeting of the Chemical Society in Dublin last week was concerned with what Professor F. A. Cotton calls "fluxional" molecules—those which have two or more equivalent nuclear configurations of lowest energy and which pass from one to another rapidly. Because the several configurations are equivalent ($\Delta G^\circ = 0$), and because the pathways of interchange are intramolecular, they may be described as "no-mechanism-no-reactions". Cotton discussed his work on cyclooctatetraene(COT)metal complexes and *sym*-tetramethylCOT (TMCOT). For COTRu(CO)₃, a true limiting low temperature proton nuclear magnetic resonance spectrum at -150°C shows resolved structure due to spin-spin coupling. Thus the molecule exists at -150°C as a (1,3-diene)metal system, and the complex dependence of nmr spectra on temperature and matching with computer-simulated spectra shows that the mechanism of rapid exchange is due to a sequence of 1,2-shifts.

M. C. Rosenblum discussed the σ -cyclopentadienyl-metal fluxional system in terms of sigmatropic 1,5-shifts. He also described the synthesis and chemistry of cyclopentadienylcobalt cyclobutadiene. A third plenary lecture, by B. L. Shaw, was concerned with allylmetal systems (which may also be fluxional). An allyl group may be π bonded to the metal, either symmetrically (π) or asymmetrically (π^1), or σ bonded. An example of the π^1 type is [PdCl(2-methylallyl)-PPh₃]. Nuclear magnetic resonance studies show that this interacts in solution either with [Pd₂Cl₂(2-methylallyl)] or with PPh₃ so as to cause rapid interconversion between π^1 and σ bonding of the allylic grouping and, sometimes, rapid PPh₃ exchange. The mechanism of synthesis of allylic complexes, by the hydrolysis of a metal carbonyl (giving CO₂) in the presence of an