

of finding a suitable test load. The snag at the moment is finding £2 million.

On d.c. motors, however, IRD has progressed much further. The biggest remaining problem, according to Mr Appleton, "is persuading people to accept a new technology". IRD's 3,250 brake horse power motor successfully drove a water pump at Fawley power station for four months in 1971, although problems with the refrigeration unit hampered work. IRD's current project involves building a 1 MW propulsion unit for the Ministry of Defence which will undergo trials at IRD shortly and will be put into a naval ship later this year. The British Steel Corporation is also interested in using a superconducting motor to power its steel mills, and if that becomes a reality, and is successful, the day may not be so far away when superconducting d.c. motors become a standard part of industry's equipment.

EDUCATION

University Physics

THE Nuffield Foundation has allocated £55,000 to bridge the gap between A-level and first-year university physics. The grant made on January 1 is for five years and is allocated on the basis of a successful pilot study carried out in 1971 and 72 at the physics departments of the universities of Birmingham, Keele, Surrey, York, Chelsea College at the University of London and University College, Cardiff.

Mr R. A. Sutton of the physics department at Cardiff, the only full-time person working on the project at present, said this week that there was an increasing problem of matching the wide range of backgrounds and ability of sixth formers to the needs of university first-year physics courses. A-level physics syllabuses vary from examination board to examination board and it is common for students to omit some parts of the syllabus when studying for their examinations. Such gaps in knowledge only become important when further work is being built on the missing parts in university. But, according to Mr Sutton, a much more important factor is the differing emphasis laid on the syllabus by school teachers.

With the problem areas now identified, during the next five years the project will be directed towards developing self-teaching units of various kinds to help students over the transition period between school and university. Efforts will also be made to refine the diagnostic procedures and the effectiveness of the self-teaching units will be analysed as the project proceeds.

The self-help material is in no way, said Mr Sutton, to be construed as replacing the A-level syllabus, and it is hoped that one of the side benefits of the project will be that university teachers will devote some time to thinking about how physics is taught. Some of the grant may also be spent in appointing temporary lecturers so that the regular staff can spend their undivided attention in preparing self-teaching manuals, or to appoint people to help the regular physics department staff to prepare the aids.

The project is guided by a committee consisting of Professor C. A. Taylor of Cardiff, Professor E. J. Burge of Chelsea College, Professor S. J. Eggleston of Keele, Professor O. S. Heavens of York and Professor K. W. Keohane of Chelsea College. It is not the first attempt to try and correlate a subject in school and university—the Nuffield Foundation has supported a similar project in biology since 1969.

CHESS

Hartston Misses Narrowly

THERE is a long tradition going back to 1895 of International Chess Tournaments held in the town of Hastings, but in some ways the ending of the most recent tournament which was held during the past three weeks has proved to be one of the most interesting of all.

The tournament was won by Bent Larsen of Denmark, who is certainly one of the most successful tournament players of recent times. Larsen played with the utmost aggression and self-assurance and scored 11½ points from his 15 games. Occasionally his style allows for some drastic defeats, and he was decisively beaten at Hastings this year both by Uhlmann of East Germany and by Radulov of Bulgaria. These defeats, however, did not deter Larsen from winning no fewer than 10 of his remaining games, including wins from each of his last four games in the tournament, a time when lesser players begin to tire and look for comparatively restful draws.

The East German, Uhlmann, ran Larsen a close second with 11 points, and when on form (as he was at Hastings) is clearly a formidable player with a similar fighting spirit to Larsen.

One surprise of the tournament was the performance of the Englishman, William Hartston, who came a clear third. Hartston, at 25, has only just qualified for his International Master title and at Hastings only narrowly missed obtaining the first leg of a "grand master" qualification. The measure of his performance can be gauged by the fact that he finished above six recognized international grand masters (including one ex-world cham-

RESEARCH AND DEVELOPMENT

Ways and Means

PROFESSOR H. B. G. CASIMIR, president of the European Physical Society and until recently head of research at Philips, Eindhoven, publicized his reservations about the customer-contractor principle as applied to scientific research in a lecture given at the Institution of Electrical Engineers last week. He proclaimed that "scientific originality cannot easily come from a sense of duty" and went on to say that in his experience the best scientific work is usually done by a person straying a little from his usual discipline to involve himself in a subject that fascinates him. The inconvenience that this may cause, Professor Casimir said, is the price that must be paid for a first-class mind.

Speaking of the relationships between technology and basic science, Professor Casimir drew attention to the way in which the dependence of one on

the other, and that as late as the thirteenth round had been joint leader of the tournament. His last two games, however, resulted in losses to the eventual first two prizewinners, Larsen and Uhlmann, but his score of 9½ points was still an excellent one.

Perhaps the greatest surprise of the tournament, however, was the relatively poor showing by the Russian representatives, Tukmakov and Smyslov, who finished only in equal fifth and ninth places respectively. At last year's Hastings Tournament, the two Russian players, Korchnoy and Karpov, finished in equal first place, but since the strafing of the top Russian players by Fischer in recent times a slightly unsettling effect has been noticed in the whole Russian camp of chess players, and their play has been rather less convincing than in previous years.

The following game is the critical and hard-fought fourteenth round game between Hartston and Uhlmann.—J.P.

Hartston (white) v Uhlmann (black)

FRENCH DEFENCE

White	Black	White	Black
1 P-K4	P-K3	27 Q-Q4	P-R5
2 Kt-QB3	P-Q4	28 P-R4	PxP
3 P-Q4	B-Kt5	29 QxQ	R(Q1)xQ
4 P-K5	Kt-K2	30 BxQBP	R-Q7
5 P-QR3	BxKt ch	31 R-B2	RxR
6 PxB	P-QB4	32 KxR	K-B2
7 Kt-B3	B-Q2	33 P-R5	Kt-B1
8 P-QR4	Q-R4	34 B-K5	R-K1
9 Q-Q2	QKt-B3	35 B-Q6	Kt-Q2
10 B-K2	QR-B1	36 P-Kt4	PxP
11 PxP	Kt-Kt3	37 P-B5	Kt-B1
12 0-0	QKtXP	38 K-Kt1	K-B3
13 KtXKt	KtXKt	39 B-Kt ch	KxP
14 Q-K3	Kt-Kt3	40 BxP	Kt-Q2
15 B-R3	B-B3	41 B-Q3 ch	K-Kt4
16 P-KB4	0-0	42 KxP	KxP
17 Q-R3	QR-Q1	43 R-K2	K-Kt4
18 B-QKt4	Q-B2	44 B-Q4	B-B6
19 B-Q3	P-B4	45 R-Q2	Kt-B1
20 Q-Kt3	R-B3	46 B-Q3	Kt-Kt3
21 Q-K3	P-QR4	47 R-R2	P-K4
22 B-R3	BxP	48 B-K3 ch	Kt-B5
23 B-Kt2	B-B3	49 R-R7	P-R6
24 P-B4	R-B2	50 B-B4	K-Kt3
25 P-KKt3	R-K2	51 R-R2	R-QR1
26 QR-K1	Q-Q2	52 P-B3	B-Q4
		White resigns	