able sophistication is going to be hard to hit. The decisions are as much political as military and scientific, and the nuclear issue is most certainly not going to be brought forward at the next election. At a nadir of public interest in the East–West military situation, one can only hope that the right decisions are being taken behind the scenes.

ASTRONOMY

Galaxy Unveiled

by our Astronomy Correspondent

Edinburgh, Tuesday

A NEW instrument which Professor H. Brück, the Astronomer Royal for Scotland, says will start a new era in optical astronomy was on show at the Royal Observatory, Edinburgh, today. Called the Galaxy machine, the instrument has already begun to speed up by orders of magnitude the reduction of data from photographic plates. Above all, Professor Brück says, the machine means that the capabilities of Schmidt telescopes can at last be fully exploited. This is the telescope favoured by astronomers for general surveys of the sky, and the 16-inch Schmidt at Edinburgh can cover an area of sky of about 4 degrees across in a single exposure of a few minutes. But the task of finding positions and brightnesses of only a fraction of the star on the plate would require an army of assistants prepared to do what is a tedious and painstaking job. This is the task that Galaxy—a roughly constructed acronym for General Automatic Luminosity and XY—is designed to carry out. A measure of how useful Galaxy is going to be was given by a delighted Dr V. A. Reddish at the observatory. This morning the first astronomical results went through the machine, and in an analysis of 25,000 stars on a plate of a region in Perseus, the machine helped astronomers to find 1,103 stars less than 2·8 million years old. Previously only fifteen stars in that category were known in the region.

Galaxy works by first scanning the plate with a spot of light to record the positions of images. In this phase of the operation, images are recorded at a rate of 10,000 per hour, with a positional accuracy on the plate of 10 microns. Then the output tape from the search phase is used as the input to the next part of the operation. The process narrows down to each image in turn which is examined with a spiral scan. At a rate of 900 images per hour, this gives the position to half a micron and the size of the image (which is a measure of brightness) to one-fifth of a micron. The nearest competitors seem to be at Lick Observatory and at the US Naval Observatory, which have machines to centre the image automatically, but the images have to be brought to the cross wires by hand and are therefore much slower.

With the machine now working, the firm responsible for its construction, Faul Coradi Scotland Ltd, hopes that the "many enquiries" which have been received about the machine can be gone into seriously. Faul Coradi is a relative of the Ferranti company where work on Galaxy began. An order from the Royal Greenwich Observatory, for delivery in 1971, is said to be imminent. Clearly wherever Schmidt telescopes are used—and a 48-inch Schmidt is believed to have been decided on as the British facility to be built alongside the Anglo–Australian telescope—there is a potential market for the machine. Professor Brück is also optimistic that Galaxy will be valuable in other disciplines. There is to be a meeting of professors from the science faculties of the University of Edinburgh during the next few days to make known the capabilities of the machine. Prospective buyers might like to know that the selling price is expected to be about £110,000.

INDUSTRIAL CONSULTANCY

Another Centre at Edinburgh

THE University of Edinburgh has taken a leaf out of the report of its own Vice-Chancellor, Professor Michael Swann, by setting up a new Centre for Industrial Consultancy and Liaison. In the report *The Flow into Employment of Scientists, Engineers and Technologists*, Professor Swann argued that there should be closer links between industry and the universities, and this is just what the new centre intends to create. It will be a "middle man" between the university and industry, selling research and expertise to industrial firms. It aims to promote consultancy by the university staff by putting firms in touch with individuals likely to be able to advise them, to promote contract research in university departments and to facilitate the secondment of industrial staff to work in the university. It also hopes to encourage members of the university staff to take on collaborative research and development work with industry and to promote time sharing of specialized university equipment and facilities.

The centre has received a grant of £27,000 from the University Grants Committee, spread over three years, and the university is providing accommodation and normal running expenses. But it is hoped that the centre will eventually earn enough money from fees and from spin-off companies backed by the university to be able to pay for itself. The centre is run by a management board, responsible to the University Court, and its director is Dr John Midgley, a physicist who has spent thirteen years working in industry. Similar centres have been set up at other universities during the past few years, but Dr Midgley claims that the Edinburgh centre is the only one engaged in selling university research in all fields to industry. Many others concentrate on a particular field, and the largest centre—the Centre for Industrial Innovation at the University of Strathclyde—has its own laboratories in which it develops prototypes and new processes under contract to industrial firms.

COMPUTER INDUSTRY

IBM climbs to a Plateau

THE fall in the value of IBM shares on the New York Stock Exchange after the announcement last week of diminished earnings in the last quarter of 1969 has seemed to many people in the business to be a reminder that even giants are mortal. In reality, however, there seems no doubt that the company's misfortune is something of an illusion. The chairman of the company, Mr Thomas J. Watson, jun., has been saying for more than a year that income in 1968 was inflated by a large amount of computer leasing business which fell in that year. What seems to have been a surprise, however, is the way in which the turnover of the

corporation fell by 3·9 per cent in the last quarter to $1,900 million. Net earnings fell by a smaller proportion, by $1·6 million to $249·2 million for the quarter. By all accounts, this is the first decline in the company's gross income for more than a decade. Although it has been something of a phenomenon that the shares should have fallen by $12 each, this represents only 2·5 per cent of their value on the New York Stock Exchange. Those who retain their faith in IBM are also heartened at the way in which the overseas business has continued to grow—in 1969 as a whole, overseas earnings increased by $62·4 million to a total of $933·9 million.

The signs of IBM's dominance in Europe are all too plain to see. For example, it is estimated that just under half of the 22,000 general purpose data processing computers in Europe have been manufactured by IBM, with other American manufacturers accounting for a sixth of the total. This is the estimate of EDP Europe Report, a fortnightly newsletter first published at the end of 1969. It is estimated that of the United States computer manufacturers operating in Europe, Honeywell and NCR each have rather less than 3 per cent of the market and that Univac takes about 4 per cent of it. The chief markets for IBM machines are in Britain, France and West Germany. Control Data has done well in West Germany and France. Burroughs is strongest in Britain. Honeywell seems to have most of its strength in Britain and West Germany.

SATELLITES

Measuring Skynet

from a Special Correspondent

Christchurch, Tuesday

A CLUSTER of buildings, hardly more substantial than the beach huts they overlook on the Hampshire coast, houses instruments which are measuring the performance of Britain's first military communications satellite 22,300 miles away. The Signals Research and Development Establishment in Christchurch is delighted to boast about the performance of both the satellite, in synchronous orbit over the Indian Ocean, and its monitors. The satellite, built by Philco–Ford of the United States and launched on November 21, has been flawless—impressively so, say SRDE men, who know from American experience how satellite behaviour can disappoint. The station, they also say, is more advanced than any except those owned by Americans, and is perhaps even better than that. Over a distance of 22,300 miles, the measurement of where the satellite is has been accurate to 30 metres—and the chief cause of error is the lack of more precise information on the speed of light and on exactly where the SRDE is on the face of the globe.

The Skynet satellite, a cylinder five feet in diameter, is more complex than the satellites now in commercial service. It is designed to work with two sizes of ground station, large and small, and has accordingly two independent pathways through its repeater. At the SRDE site in Christchurch, a 40 foot dish built by Marconi, and a smaller, much publicized transportable dish called IDEX, are both used to send signals up to the satellite, testing its capacity to keep both paths separate. Ironically, it seems to be the military rather than the commercial communicators who are developing the kind of light simple terminal that could bring television to primitive villages. The IDEX, its transmitter air-cooled, its receiver uncooled, can be set up by two men in 45 minutes and can be transported by Land Rover or helicopter.

Pride of place in SRDE's Skynet measuring exercise is a 6 foot aerial which measures the intensity of the microwave flux received by Skynet. Even the US Air Force, which holds the ministry's hand in the Skynet project, does not have such a monitor. But as the British are paying for a contract placed by the Air Force with an American company, their need to be assured of value for money is perhaps the greater. The total cost is £18 million for a package which includes two satellites and two launches from Cape Kennedy.

A general view of IDEX

The first signal from the satellite was caught on December 12 and since then monitoring has been continuous. The signal is amplified and brought in by cable to the test laboratory where it is split into three. The purpose of the test is to measure how the satellite is behaving in its new environment and to estimate its length of life (hoped to be three years). The crucial time will come in March and October, when the satellite will be for a time encased in the Earth's shadow. As the first round of tests has been completed, the satellite is being used more and more for Royal Air Force communications. It will be joined in orbit later this year by another, and the two will give the Ministry of Defence more flexible and reliable links than it now gets from high frequency radio.

The completed Skynet or network will have nine Earth stations from Britain to Singapore, including two in ships and two ready to be flown where needed. The bureaucratic relationships involved in Skynet are complicated and dominated by the United States. The SRDE helps MOD with research and development in telecommunications and the US Air Force has allowed MOD a place in its own military satellite programme. Skynet, although Britain's own, will work with the US Defense Satellite Communications System. Why these