actually completed this year four months ahead of schedule. The scheme involved clearing and levelling 450 acres of wooded gravel-land; construction of roads; laying down a railway system to connect up with permanent way to Southampton; erecting a huge building, 800 ft. long, 180 ft. wide and occupying more than 3 acres, first to house constructional materials, ultimately to serve as maintenance and machine shop; lay-out of a construction camp on site for 750 workmen; erection of a huge concrete plant with output of 140 cubic yards per hour, one of the largest in the world; installation of the main refinery units, in itself a colossal task of erecting and linking-up the bewildering maze of pipes, tanks, stills, furnaces and huge towers that go to make up a modern oil refinery. Add to this permanent houses for key-staff, a beautiful theatre and games building (social club) and it is at once obvious that the Fawley we used to know has been completely transformed into a self-contained city of potentially some 2,000 inhabitants; incidentally, some of the original inhabitants appeared to be almost Americanized.

A tour of the refinery during the day before the official opening provided unrivalled opportunity for studying the lay-out in technical detail. Crude oil is delivered by tanker to a specially constructed marine terminal, a 3,200-ft. jetty jutting into Southampton Water and connected to the main plant by a 2,000-ft. long approach road, constructed over salt marsh-land, carrying oil, steam and salt-water pipe-lines into the heart of the refinery itself. Thence fed to storage tanks, oil eventually passes through pipe-still furnaces to heat it up to 750° F.; thus vaporized, it enters the fractionating tower where condensation takes place at different levels on 'bubble trays'.

There are three fractionating towers here, two operating at atmospheric pressure, and a third under vacuum with steam distillation to deal with 'bottoms' from the other two. An outstanding feature is undoubtedly the huge catalytic cracking plant ('cat cracker') fed with gas oil, using a catalyst in an extremely fine state of particle division (technically known as 'fluid catalytic cracking'). A specially designed thermal-cracking plant converts lubricating oil and motor spirit into high-octane spirit plus gas. A polymerization plant determines increase in octane-rating of motor spirit obtained by distillation. A debutanizer tower, 113 ft. high, weighing 135 tons, separates butane and associated volatiles from motor spirit, designed to meet current vapour-pressure specifications. The copper sweetening unit removes corrosive compounds and evil-smelling vapours from motor spirit. Then there is the Edeleanu plant for improving burning qualities of kerosene; a hypochlorite plant for removing unpleasant sulphur compounds from kerosene and turbo-jet fuels; the lubricating oil plant, involving propane de-asphalting, phenol extraction, propane de-waxing and clay treatment processes. The oxidizing plant produces some well-known 'blown' grades of asphaltic bitumen; a 'specialty' unit manufactures anti-corrosive additives for lubricating oil; a hydro-desulphurization plant effects removal of sulphur from tractor-fuel.

In view of the serious shortage of sulphur at the present time, a vitally important unit under construction is the sulphur plant, for the conversion of hydrogen sulphide, released during varying stages of refining crude oil, into chemically pure 99.5 per cent rock sulphur. Full sulphur production is scheduled for early 1953; output will be of the order of 12,000 tons a year.

Fawley now assumes priority as the largest oil refinery in Europe. It cost £37,500,000 to build. When in full operation it will produce 6,500,000 tons of petroleum products a year; more than a million gallons of motor spirit a day; and nearly 30 per cent of present total demand for petroleum and products in the British Isles. Not least in these financially stringent times, this brilliantly planned and executed work will effect a saving in foreign exchange of more than 2 million dollars a week.

Someone concerned with the lavish series of publications which a great occasion like this official opening obviously presented had the foresight and sensitive imagination to commission H. E. Bates to write a commemoration 'Fawley Achievement', 'as a tribute to the vision, skill, and energy of all those who helped to plan and build it'. Much praise was heard throughout the time of our tour of the new Fawley; but many read this tribute with a feeling that no one could have done it better than Bates, nor given to the sponsors of this great enterprise more encouragement for the future than is justly their due.

H. B. MILNER

OBITUARIES

Mr. G. Udny Yule, C.B.E., F.R.S.

GEORGE UDNY YULE was a member of a family distinguished for its scholarship and administrative talent. His father, Sir George Udny Yule, a very successful administrator in the Indian Civil Service, was one of three sons of Major William Yule, of the East India Company's service, who was born in 1764 and was in his day a well-known Orientalist; of the others, one, Lt.-Colonel Robert Abercromby Yule, a rising cavalry officer, was killed at Delhi in command of the 9th Lancers in 1857; the other, Colonel Sir Henry Yule, is remembered internationally for his authoritative edition of Marco Polo's travels. Udny Yule thus had an oral tradition of learning and of civil and military administration reaching back to the end of the eighteenth century. Udny Yule himself was educated at Winchester and University College, London. Science and engineering were his early interests, and he spent a postgraduate year under Hertz at Bonn on research into the passage of electric waves through dielectrics, which formed the subject of his first published paper. This field, however, was not very close to his heart, and he never reverted to it.

Udny Yule's scientific career proper began in 1893, when he joined Karl Pearson at University College, London, as lecturer in statistics. Pearson was laying the foundations of the science of theoretical statistics and it was not long before Yule himself was making fundamental contributions to the subject. For the next fifteen years he devoted himself mainly to the theory of statistical relationship, publishing basic memoirs on correlation (1897, 1907) and on association (1900). His work on association was later (1912) summarized in a further paper, and little has been added to it since; his work on correlation, in one form or another, continued throughout most of his life.

From 1902 onwards Yule gave a series of New-march Lectures which in 1911 were amplified and published as 'An Introduction to the Theory of Statistics'. This famous text-book remained for many years the only extensive account of the subject. There are very few students of statistics even to-day

who do not owe something to it. With numerous subsequent revisions it has reached its fourteenth edition and appears to be maintaining its place in spite of its now numerous competitors; it has been translated into several languages, notably Czech and Spanish.

In 1912 Yule went to Cambridge, where he became a Fellow of St. John's College and University reader in statistics. His academic career was interrupted by the First World War, and he spent the four years 1914-18 in the Contracts Department of the Board of Trade, his services being recognized by a C.B.E. Thereafter, scientific recognition followed by easy stages. He was elected a Fellow of the Royal Society in 1921, and president of the Royal Statistical Society in 1923, having been awarded that Society's highest honour, the Guy Medal in Gold, in 1911. He was honoured by several foreign societies and in 1947 was made an honorary member of the International Institute of Statistics.

During the phase from 1912 until 1927, Udny Yule's work fell into two classes. In conjunction with Major Greenwood he laid the foundations of the study of accident distributions, a subject which nowadays has a much wider field of application than when Yule began on it. His interest in statistical relationship found expression in a paper of 1921 on time correlation and one in 1926 on 'nonsense correlations'. His work culminated in a famous paper in 1927 on sunspots, which forms the starting point of the modern theory of oscillatory time-series.

In 1931 Yule retired and, characteristically, took up flying as a hobby. He was very proud of obtaining a pilot's certificate *A* at the age of sixty; but unfortunately his heart gave serious trouble shortly afterwards, and the remaining twenty years of his life were spent in comparative seclusion at Cambridge, which he rarely left.

His main scientific work was now at an end; but the literary and philological interests of his family began to show themselves. Moved by doubts cast on the traditional attribution of the authorship of the "Imitatio Christi" to Thomas à Kempis, he was led to a statistical study of literary vocabulary, on which he published his last book in 1944. His strength then failed, and during the closing years he was able to accomplish very little. He died at the Evelyn Nursing Home at Cambridge on June 26, 1951, at the age of eighty.

Yule's work is characterized by its originality, its thoroughness and a wonderful insight into the problems which he studied. A great many of the basic ideas of statistical theory can be traced back to his papers, where they find expression with the modesty and simplicity of genius. He was one of the statistical giants of his age. In spite of some provocation he never embarked on controversy, and his objectivity towards his fellow statisticians is without blemish. In character he was kindly and sociable, with opinions soundly based, firmly held but moderately expounded—a thoroughly lovable man.

M. G. KENDALL

WE regret to announce the following deaths:

Dr. K. C. Bailey, registrar of the University of Dublin, and during 1935-47 professor of physical chemistry in the University, aged fifty-five.

Sir Eric Maclagan, K.C.V.O., C.B.E., during 1924-45 director and secretary of the Victoria and Albert Museum, London, on September 14, aged seventy-two.

Prof. F. W. Oliver, F.R.S., emeritus professor of botany, University College, London, on September 14, aged eighty-seven.

NEWS and VIEWS

Higher Technological Education in Great Britain

THE statement of Government Policy for the Development of Higher Technological Education in Great Britain (London: H.M. Stationery Office, 3*d*. net) issued on September 20 sets forth the Government decisions on the report of the National Advisory Council on Education for Industry and Commerce, but gives little indication of real policy in either technical or technological education. The two are not clearly distinguished; but so far as the former is concerned, the policy would appear to be 'the mixture as before'. In regard to technological education, the chief feature is the rejection of the idea of a technological university, whether an entirely new institution or by the expansion of some existing institution. The cost of such a proposal is estimated at £6 millions, and its creation by either method is regarded as requiring too large a diversion of available resources. Instead, a policy of diversified expansion is to be pursued. The universities are to be encouraged to expand their existing departments in technology and to institute postgraduate courses in particular fields of technology, while the University Grants Committee is considering the possibility of expanding much more considerably at one or two places. On this side it will not be possible to pass judgment until the University Grants Committee

indicates its proposals for the next quinquennium; but the Statement intimates that the Government proposals for making improved financial assistance available for selected technical colleges and courses will be announced shortly.

According to the Statement, some sixty technical colleges in England and Wales and six in Scotland provide higher technological education; but until these further details are made public it cannot be judged whether the proposed policy will yield any effective return and not lead to waste of resources through excessive diffusion. The Government has accepted the dubious proposal to establish a College of Technologists—though the use of the title 'Royal' is temporarily to be withheld—with responsibilities limited to granting awards of associateship, etc., and for the approval of courses for this purpose. Until the details of the Government's own proposals for selected technical colleges and those of the University Grants Committee in regard to the universities are made known, the value of the proposals cannot be judged. The trend of the Statement indicates a desire to court the favour of the universities and of the local education authorities, rather than to deal imaginatively with the real issues and to ensure that existing resources are used to the best advantage, from the national, and not from any sectional, point of view.