

become potent sources of sound. The sound field around the jet will then be rather like that of light in front of an optical grating—that is to say, there will be directions in which the energy from different sources will constructively and destructively interfere—and there is some experimental evidence, from polar curves of supersonic jets, which supports this. What is perhaps more important is that in this range of speeds the noise-level increases at a power of the jet velocity much higher than the eighth—perhaps, the twentieth or more.

This behaviour of jets at subsonic and supersonic speeds was described by Prof. E. J. Richards and G. M. Lilley at a symposium on "Aeronautical Acoustics, in particular Jet Noise", held in London on May 21 under the joint auspices of the Royal Aeronautical Society and the Acoustics Group of the Physical Society. Other speakers dealt with the noise of jets in gas-turbine engines (F. B. Greatrex) and the noise of jet aircraft (N. Fleming and J. D. Hayhurst). The bangs heard as an aircraft crosses the sound barrier were described by C. H. E. Warren, and these have been the subject of a recent article in *Nature*<sup>12</sup>.

In the discussion which followed, speakers emphasized the nuisance which the starting and landing of aircraft constitute to those who live and work in the vicinity of aerodromes and the need for mitigation of the noise if aircraft travel at still higher speeds. Some of the speakers described tests of devices to reduce jet noise, but none of the reductions amounted to much in terms of decibels. A dilemma seems to have been reached in which the only cure for the noise is to reduce efflux velocity, but this means wider jets to maintain the thrust and so heavier engines, which could rob the gas turbine of one of its chief advantages.

<sup>1</sup> Richardson, E. G., *Proc. Phys. Soc.*, **32**, 394 (1931).

<sup>2</sup> Powell, A., *J. Acoust. Soc. Amer.*, **25**, 193 (1953); *Acustica* (in the press).

<sup>3</sup> Curle, N., *Proc. Roy. Soc. A*, **216**, 412 (1953).

<sup>4</sup> Richardson, E. G., *Proc. Phys. Soc.*, **43**, 400 (1931).

<sup>5</sup> Hubbard, H. H., and Lassiter, L. W., *J. Acoust. Soc. Amer.*, **25**, 184 (1953); N.A.C.A. Report TN 2757.

<sup>6</sup> Schuh, H., and Winter, K. J., *Proc. Intern. Cong. Appl. Mech.*, **2**, 61 (1948); R.A.E. Report Aero., 2412.

<sup>7</sup> Richardson, E. G., *Proc. Roy. Soc. A*, **203**, 149 (1950).

<sup>8</sup> Nyborg, W. L., Burkhard, M. D., and Schilling, H. K., *J. Acoust. Soc. Amer.*, **24**, 293 (1952).

<sup>9</sup> Lighthill, M. J., *Proc. Roy. Soc. A*, **211**, 564 (1952).

<sup>10</sup> Hartmann, J., *Phys. Rev.*, **20**, 719 (1922).

<sup>11</sup> Richards, E. J., *J. Roy. Aero. Soc.* (May 1953).

<sup>12</sup> Lilley, G. M., Westley, R., Yates, A. H., and Busing, J. R., *Nature*, **171**, 994 (1953).

department of Gordon Memorial College. Here he was destined to spend the next twenty-eight years, years of memorable service during which the Wellcome Laboratories in Khartoum became world-famous as an institute of tropical research under the direction of Sir Andrew Balfour, later of Dr. A. J. Chalmers, and finally of Sir Robert Archibald himself. He held the post of director from 1920 until his retirement in 1936, when the Wellcome Tropical Research Laboratories were divided among various departments of the Sudan Government.

These were years of intense productive activity. Archibald contributed numerous papers to the Reports of the Wellcome Tropical Research Laboratories, and with Balfour he compiled the "Reviews of Recent Advances in Tropical Medicine", published as supplements to the Reports and continued as the *Tropical Diseases Bulletin* by the Bureau of Hygiene and Tropical Medicine in London. He was a contributor to the "Oxford Index of Therapeutics" (1921) and editor (with Byam) of the monumental treatise, in three volumes, on "The Practice of Medicine in the Tropics" (Oxford Medical Publications). Archibald's own researches during this period are scattered through the scientific and medical journals in innumerable articles covering almost every aspect of tropical medicine and hygiene. He was local secretary of the Royal Society of Tropical Medicine and Hygiene, president of the Sudan Branch of the British Medical Association, member of the executive committee of the British Empire Leprosy Relief Association and *membre correspondant* of the Société de Pathologie Exotique. He was one of the original members of the Council of the Kitchener School of Medicine and later a member of its executive committee in London. He was also a member of the executive committee of the University College of Khartoum.

During the period of his Sudan service, Sir Robert Archibald saw active service in the Blue Nile operations (1908), Mediterranean Expeditionary Force (Dardanelles, 1915), and in the Darfur expedition (1916). He was several times mentioned in dispatches; he was awarded the D.S.O. in 1917, C.M.G. in 1928 and created knight bachelor in 1934. He was awarded also the Order of the Nile (second class) and Order of the Mejidieh (fourth class). After his retirement from the Sudan, Sir Robert Archibald was for a time medical superintendent of the Chacachacare Leper Settlement, Trinidad, West Indies. Later, during the Second World War, he was pathologist, County Laboratory, Poole, Dorset, and for some years before his death he was professor of bacteriology and parasitology in the Farouk University, Alexandria, Egypt.

Although it is nearly twenty years since Sir Robert Archibald left the Sudan, he is still remembered here with deep affection and respect—the good physician, able investigator, wise administrator, kind teacher and great gentleman whose death symbolizes the passing of an era.

ROBERT KIRK

## OBITUARIES

### Sir Robert Archibald, C.M.G.

ROBERT GEORGE ARCHIBALD died suddenly on May 2 in Salisbury, Southern Rhodesia, at the age of seventy-three years. He was the son of the Rev. W. F. Archibald, chaplain to the Forces, and was educated at Dollar Academy and the University of Edinburgh, where he graduated in medicine in 1902. After holding various house appointments, he entered the Royal Army Medical Corps in 1906, and was a pathology prizeman in the Royal Army Medical College, where he worked with Sir William Leishman. In 1907 he was seconded to the Sleeping Sickness Commission in Uganda. In 1908 he was attached to the Egyptian Army and appointed assistant pathologist and bacteriologist in the Wellcome Tropical Research Laboratories, Khartoum, which was then a

### Prof. D. Hanson

PROF. DANIEL HANSON was born in 1892 and was educated at Wallasey Grammar School and at the University of Liverpool, where he took the degree of M.Sc. After a short time at the Research Department, Woolwich, he went in 1913 to the National Physical Laboratory as junior assistant (now called junior scientific officer) in the Metallurgy Division.