HISTORY OF BRITISH SPACE SCIENCE

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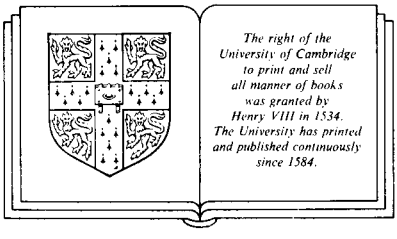
SIR HARRIE MASSEY FRS
Late Emeritus Professor of Physics, University College London

M.O. ROBINS CBE
Formerly Director of Astronomy Space and Radio, and of Science, Science Research Council



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Glossary of abbreviations in the text and annexes

Where the initials refer to a French title, the English version is given.

ABRC	Advisory Board for the Research Councils
ACSP	Advisory Council on Scientific Policy
AMPTE	Active Magnetospheric Particle Tracer Explorers
APGC	Astronomy Policy and Grants Committee
ARD	Astrophysics Research Division
ASRB	Astronomy Space and Radio Board
AURA	American Association for Research in Astronomy
AWG	Administrative Working Group
AWRE	Atomic Weapons Research Establishment
BAC	British Aircraft Corporation
BNCSR	British National Committee on Space Research
CERN	European Organization for Nuclear Research
COPERS	European Preparatory Commission for Space Research
COSPAR	Special Committee on Space Research
CSAGI	Special Committee for the International Geophysical Year
CSP	Council for Scientific Policy
DOE	Design of Experiments Sub-committee
DSIR	Department of Scientific and Industrial Research
ELDO	European Launcher Development Organization
ESA	European Space Agency
ESC	European Space Conference
ESDAC	European Space Data Centre
ESF	European Science Foundation
ESLAB	European Space Laboratory
ESRANGE	European Space Range
ESTEC	European Space Technology Centre
ESRO	European Space Research Organization

ESTRACK European Space Tracking Network
EUV Extreme Ultra-violet
EXOSAT European X-ray Observatory Satellite

FOC Faint Object Camera

GEOS Geostationary Magnetospheric Satellite
GSFC Goddard Space Flight Center
GTST Scientific and Technical Working Group

HEAO High Energy Astronomical Observatory
HEOS Highly Eccentric Orbit Satellite

IAF International Astronautical Federation
IAU International Astronomical Union
ICSU International Council of Scientific Unions
IGY International Geophysical Year
INCOSPAR Indian Committee on Space Research
IQSY International Year of the Quiet Sun
IRAS Infra-red Astronomy Satellite
ISEE International Sun Earth Explorer
IUB International Union of Biochemistry
IUBS International Union of Biological Sciences
IUE International Ultra-violet Explorer
IUGG International Union of Geodesy and Geophysics
IUPAC International Union of Pure and Applied Chemistry
IUPAP International Union of Pure and Applied Physics
IUPS International Union of Physiological Sciences
IUTAM International Union of Theoretical and Applied Mechanics

JPL Jet Propulsion Laboratory

LAS Large Astronomical Satellite
LPAC Launching Programmes Advisory Committee
LST Large Space Telescope

NACA National Advisory Committee for Aeronautics
NASA National Aeronautics and Space Administration
NATO North Atlantic Treaty Organization
NEDC National Economic Development Council
NIRNS National Institute for Research in Nuclear Science
NRDC National Research Development Corporation

OAO Orbiting Astronomical Observatory
OSO Orbiting Solar Observatory

PSAC President's Science Advisory Committee

PSSAB Provisional Space Science Advisory Board
PSSB Provisional Space Science Board

RAE Royal Aircraft Establishment
RPE Rocket Propulsion Establishment
RRS Radio Research Station
RSRS Radio and Space Research Station

SAS Small Astronomical Satellite
SCOSTEP Special Committee on Solar and Terrestrial Physics
SERC Science and Engineering Research Council
SMM Solar Maximum Mission
SPC Science Programme Committee
SPGC Space Policy and Grants Committee
SPM Solar Polar Mission
SRC Science Research Council
SRMU Space Research Management Unit
SSB Space Science Board
SSC Space Science Committee
ST Space Telescope
STC Scientific and Technical Committee
SUPARCO Pakistan Space and Upper Atmosphere Research Council

TADREC Tracking and Data Recovery Sub-Committee
TD-1 Thor-Delta 1 (Satellite)
TD-2 Thor-Delta 2 (Satellite)
TMA Trimethylaluminium

UKAEA United Kingdom Atomic Energy Authority
UNESCO United Nations Educational and Scientific Committee
URSI International Union of Radio Science
UVAS Ultra-violet Astronomy Satellite

WRE Weapons Research Establishment
acu attitude control unit
elf extremely low frequency
rf radio frequency
vhf very high frequency
vlf very low frequency

Glossary of abbreviations in the appendices

AFCRL	Air Force Cambridge Research Laboratories
AL	Appleton Laboratory of the Science and Engineering Research Council
ARD	Astrophysics Research Division of the AL
ARU	Astrophysics Research Unit of the Culham Laboratory
ASE	American Science and Engineering Inc.
BAC	British Aircraft Corporation
Bel	Queen's University, Belfast
Bir	University of Birmingham
Bkb	Birkbeck College University of London
Bn	University of Bergen
Bri	University of Bristol
BTI	Braunschweig Technical Institute
Camb	University of Cambridge
CNIE	Comisión Naciónal de Investigaciónes Espaciales, Argentina
CRC	Communications Research Centre, Ottawa
CRESS	Center for Research in Experimental Space Science, University of York, Toronto, Canada
Cul	Culham Laboratory of the UK Atomic Energy Authority
DFVLR	Deutsche Forschungs- und Versuchsanstalt für Luft- und Raumfahrt EV
EMIE	EMI Electronics Ltd London
ESTEC	European Space Technology Centre
Gr	Technical University Graz
GSFC	Goddard Space Flight Center of NASA
HCO	Harvard College Observatory
Hd	University of Heidelberg
IC	Imperial College of Science and Technology, London
ISRO	Indian Space Research Organization
JB	Jodrell Bank, Nuffield Radio Astronomy Laboratories
KTH	Royal Institute of Technology Stockholm
Lei	University of Leicester

MIT	Massachusetts Institute of Technology
MO	Meteorological Office
MPG	Max Planck Institute Garching
MPI	Max Planck Institute
MSSL	Mullard Space Science Laboratory, University College London
NASA	National Aeronautics and Space Administration
NDRE	Norwegian Defence Research Establishment
NRDE	Norwegian Research and Development Establishment
Oxf	Oxford University
PRL	Physical Research Laboratory, Ahmedabad
RAE	Royal Aircraft Establishment, Farnborough
ROE	Royal Observatory Edinburgh
RRS	Radio Research Station, later RSRS
RSRS	Radio and Space Research Station, later Appleton Laboratory
Shf	University of Sheffield
SSC	Swedish Space Corporation
Sth	University of Southampton
Sx	University of Sussex
Tb	University of Tübingen
UA	University of Adelaide
UCB	University of California, Berkeley
UCL	University College London
UCW	University College of Wales, Aberystwyth
UIO	Uppsala Ionospheric Observatory
WRE	Weapons Research Establishment, Australia

PREFACE

Space Science in Britain was initiated, and the foundations for its development were laid, very largely by one man, the late Sir Harrie Massey. Sadly, his untimely death in November 1983 occurred before this Preface could be written, but the main text of the History was complete. It bears witness to the enormous contribution which he made through his vision, foresight and determination. With the close co-operation of the late Sir David Martin, then Executive Secretary of the Royal Society, and the late Roger Quirk, then a senior member of the Ministry for Science, Massey as Chairman of the British National Committee on Space Research, took the lead in harnessing the essential components for a British Space Science programme.

The resulting combination of science, mainly from university departments of physics, and technology, mainly from government research establishments, supported by government funds and backed by electronic and aerospace firms in British industry, proved to be very successful and more than able to hold its own with the tightly organized Space Agencies of other countries. Massey always believed that his first duty lay with British Universities, but his vision extended far beyond those boundaries. From the mid-1950s to the end of his life he was tireless in stimulating and encouraging international co-operation in the furtherance of space science. The extensive and highly successful joint programme between Britain and the USA, the genesis and development of the European Space Research Organization, later to become the European Space Agency, the Commonwealth Collaborative Programme and many aspects of the work of COSPAR and of the European Science Foundation, all bear the marks of Massey's genius for leadership in co-operative programmes of science.

The concept of this History arose during discussions between the two

authors in 1978. We realized that the scale of global space science had already outstripped the scope of a concise History. However, we thought that the time was ripe for the compilation of a History of the British contribution to the first 25 years or so of the subject, whilst memories were still relatively fresh and many of the leading participants still available for consultation. We believed also that there would be merit in putting on record how a new branch of science had actually been started and developed; how the resources of scientific manpower, the technological skills and not least the financial support, could be co-ordinated and brought together to achieve very complex and precise objectives.

We were very fortunate in enlisting the encouragement and support of Sir Geoffrey Allen, the Chairman of the then Science Research Council. This culminated in a Commission from the Science and Engineering Research Council in 1981 to prepare the present History. Whilst the activities of the first few years can readily be described in chronological order, the many parallel strands into which the programmes have developed necessitate a corresponding subject division in later chapters. Throughout, we have tried to give sufficient of the scientific and technological background to enable the reader to appreciate the major British contributions which have been made to this global subject.

We are indebted to very many individuals and organizations for information, comment and permission to include photographs and diagrams.

We have relied heavily on the excellent documentation held in the archives of the Royal Society, and on the help we were given by its Executive Secretary Dr R.W.J. Keay, and his staff. A particular acknowledgment is due to Mr P. Wigley, who was tireless in his search for information and never failed us in following up the most obscure references. Similarly, we were greatly helped by records held in the Rutherford Appleton Laboratory of the SERC and by the advice of Mr J. Delury and Mr J. Reed. Dr M.A.R. Kemp of the SERC Swindon Office has assisted us in many administrative matters.

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