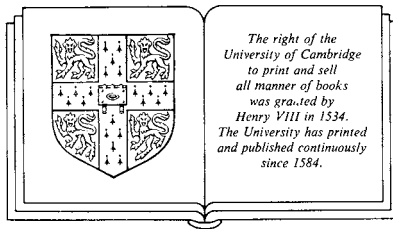


ALL SCIENTISTS NOW

The Royal Society in the nineteenth century

MARIE BOAS HALL

Emeritus Reader in History of Science and Technology
Imperial College, London University



CAMBRIDGE UNIVERSITY PRESS

Cambridge

London New York New Rochelle

Melbourne Sydney

Published by the Press Syndicate of the University of Cambridge
The Pitt Building, Trumpington Street, Cambridge CB2 1RP
32 East 57th Street, New York, NY 10022, USA
296 Beaconsfield Parade, Middle Park, Melbourne 3206, Australia

© Cambridge University Press 1984

First published 1984

Printed in Great Britain by the University Press, Cambridge

Library of Congress catalogue card number: 84-7705

British Library cataloguing in publication data

Hall, Marie Boas

All scientists now.

1. Royal Society – History

I. Title

506'.041 Q41.L85

ISBN 0 521 26746 3

CONTENTS

<i>List of illustrations</i>	<i>page</i> vi
<i>Foreword</i>	vii
<i>Preface</i>	ix
1 The eighteenth-century legacy	1
2 Trial and error (1820–1830)	16
3 Reform and revision (1830–1848)	63
4 How reform worked: the running of the Society 1848–1899	92
5 The encouragement of science	143
6 Relations with Government	162
7 Relations with other societies	182
8 The encouragement of scientific exploration	199
9 The end of the century: a truly scientific society	216
<i>A note on sources</i>	221
<i>Notes to the text</i>	223
<i>Bibliography</i>	247
<i>Index</i>	251

ILLUSTRATIONS

Frontispiece: The Deputation to Faraday 1857

1: Joseph Banks	xiv
2: W. H. Wollaston	19
3: Thomas Young	20
4: Sir Humphry Davy	33
5: Davies Gilbert	34
6: John Herschel	59
7: The Duke of Sussex	60
8: The Marquis of Northampton	75
9: J. G. Children	76
10: The Earl of Rosse	93
11: The Meeting Room in Somerset House	98
12: The Meeting Room in Burlington House 1863	98
13: Lord Wrottesley	101
14: Sir Benjamin Collins Brodie	102
15: General Sabine	109
16: G. B. Airy	110
17: Joseph Hooker	113
18: T. H. Huxley	114
19: W. Spottiswoode	121
20: G. G. Stokes	122
21: Lord Kelvin	129
22: Lord Rayleigh	130
23: Sir Joseph Lister	133
24: Michael Foster	134
25: W. A. Miller	137
26: Sir John Evans	138

Reproduced by kind permission of the President and Council of the Royal Society from negatives in their possession

The eighteenth-century legacy

When the nineteenth century opened, there was no reason to suppose that the Royal Society would change from its eighteenth-century pattern, nor indeed was there any reason to suppose that it needed change. Sir Joseph Banks, rich, influential and eminent, was almost exactly at the mid-point of his forty-two-year term as President. This fact, as well as his rôle as patron of learning, both intellectually and socially, strikingly illustrates the leisurely atmosphere of intellectual life that existed in the Royal Society as in the literary and philosophical societies of the provinces in an age before intellectual specialisation and the social development of Club life. Indeed, the Royal Society, founded 'for improving naturall Knowledge' in the mid-seventeenth century, had had little reason or impetus to change the views of its founders, who combined a Baconian belief that any willing, literate man might contribute to that improvement with the practical understanding that a society dependent for its finances upon the contributions of its members needed a reasonable proportion of the rich and the influential to survive.

The election as President in 1778 of Joseph Banks (F.R.S. 1766) – young, wealthy, with the glamour of his voyage with Cook still alive, botanist and generous patron of botanists, a friend of George III – perfectly conformed to the seventeenth-century as to the eighteenth-century ideal, and as a result the Society could look forward with some certainty to a period of prosperity. Crown favour led to the offer of relatively spacious apartments in Somerset House, to which the Society moved in 1780 (from the now cramped quarters in Crane Court, purchased in Newton's Presidency). Banks's own position as patron of science flourished too, and every country and foreign visitor with any intellectual pretensions was flattered to be able to attend Banks's Sunday evening receptions and his lavish and stimulating breakfast parties, all of which might lead to election as F.R.S., either domestic or foreign.

That Banks was made a baronet in 1781 gave even more lustre to his patronage, and to the Society over which he presided with a firm hand.

His dominance was challenged only once, in 1784, and it is difficult to analyse the exact position of the rebels.¹ The protagonist was Charles Hutton, who taught mathematics at Woolwich; he had been elected Foreign Secretary of the Society in 1779, but was dismissed by Banks ostensibly for non-residence in London and, so Banks declared, consequent inability to discharge his office. His chief supporter was Samuel Horsley, then editing Newton's works, a man of minor mathematical reputation, later a bishop. Was this, as some have seen it, a revolt of 'professionals' against 'gentlemen'? Was it rather, as Horsley tried to make it, a revolt of the mathematical scientists against (to use a neologism) the biological scientists, A against B? Certainly under Banks the biological sciences were given greater importance than they were to receive for much of the nineteenth century: Banks began that close association of the Royal Society with the British Museum (then still subsuming natural history and antiquities under one roof) which continued well into the nineteenth century (many of the Society's Secretaries being officers of both institutions, and the President *ex officio* a trustee); he also much assisted James Edward Smith in the founding of the Linnean Society in 1788. Banks triumphantly won control in 1784, and the biological sciences dominated for the rest of the century, in contrast to the later nineteenth-century power struggle which was to be all the other way.

In 1800 Banks, then fifty-seven years old, and in the twenty-second year of his Presidency, could look back with some satisfaction over his 'reign' (as younger contemporaries felt it to be) and forward with confidence. The Society was, in his eyes, in a very flourishing shape, and he was in a position to know: it has been calculated that of 450 Council meetings during his forty-two years as President he attended no fewer than 417,² and he insisted on controlling the membership of the Society, scrutinising the proposals for all candidates. And as if to prove the virtues of his rule he was, in 1801, made a member of the newly formed and highly prestigious Institut de France, an honour he much appreciated, although, ironically in the light of the unstinted approval given to the Institut by English scientists a generation later, there was some decided criticism of Banks's acceptance on the grounds that it was unpatriotic to accept honours from an enemy.

What, it well may be asked, did the Society do during the later years of Banks's Presidency, when he was so firmly in control? The Journal Books (containing minutes of the Society's meetings) reveal a pattern for meetings established in the later eighteenth century and not to be disturbed during Banks's lifetime whether he was presiding (as he normally did) or was absent

(as occasionally happened in the earliest years of the new century, but hardly otherwise). Since 1780 the meetings had begun at 8 o'clock on Thursday evenings. The minutes record that the strangers present (not more than two might be introduced by each Fellow) were first named (and presumably welcomed), after which the minutes of the previous meeting were read, followed by a list of 'presents' (books, specimens, occasionally instruments and even portraits). Then came the reading of the certificates of proposed new members, before their suspension in the meeting room, and, when appropriate, balloting for those proposed earlier (only foreign members, limited in number, were elected annually), and the admission of any Fellows previously elected within the past four weeks (the statutes requiring that any Fellow not so presenting himself forfeited his election, though custom permitted petitioning the Council for delay). After this business was completed, a paper was read in full, in abstract or in part, to be continued at later meetings if too long to fit into the time allotted (about one hour).

Thus in his diary under 11 April 1811 Lord Webb Seymour (F.R.S. 1802, younger brother of the 11th Duke of Somerset, F.R.S. 1797, both keen amateurs of science) recorded that he attended 'a meeting of the Royal Society, to hear Mr Playfair read a part of his paper on the Huttonian theory of volcanoes'.³ Similarly on 26 January 1814 Charles Babbage (F.R.S. 1816) informed his intimate friend John Herschel (F.R.S. 1813) that 'I was last thursday at a Meeting of the Royal Society where a paper of Davy's was read of a highly curious nature';⁴ as Babbage was not yet a Fellow he necessarily had been introduced by a Fellow. Papers were sometimes read by the author (if he were a Fellow), usually by one of the Secretaries; when the papers were by Fellows they were sent or handed to the Secretary with or without the President's approval; when not by Fellows they were either submitted by them to the Secretary or 'communicated' directly by the Fellow concerned. There was at this time no discussion of papers, although occasionally there was a movement to have the custom re-introduced; it had been usual until the mid-eighteenth century but was now claimed to be contrary to existing statutes (which were really intended to preclude unplanned discussion of administrative or political matters) and many Fellows thought it undesirable because undignified and possibly introducing heat into what was intended to be a solemn occasion. But the established procedure could be dull. According to John Barrow (F.R.S. 1806, when he had just begun his long career as second Secretary to the Admiralty, junior to J. W. Croker, F.R.S. 1810) 'The subjects were generally scientific [!] and I confess I often found them dull enough in themselves, and not always improved by the monotony of an official reader, sometimes weary of his

task'.⁵ Papers so read were then considered for publication in the *Philosophical Transactions* by the Committee of Papers, and most (but not all) were published.

Barrow clearly preferred the social side of membership in the Royal Society: breakfast or 'conversation' with the President, tea-table conversation after the meetings, and dining with other members of the Royal Society Club before the meeting, at 6 o'clock. This Club was limited in membership (forty Fellows by 1820), strangers at first being invited only by the President, although later by other members. Elected members who were not regular in attendance were dropped. Its social composition was varied, by no means confined to Court or Government circles – Marc Isambard Brunel (F.R.S. 1814) was a member in 1816, as Lord Webb Seymour informed his brother.⁶ Barrow, an enthusiastic but totally non-scientific Fellow (although he had travelled widely, his appreciation of the geography of regions unknown to him was decidedly limited) all unconsciously illustrated one of the weaknesses of the Royal Society of his time, namely that its composition was far from uniformly devoted to any specific pursuit. For although all Fellows were supposed to be *interested* in the world of learning, it was by no means thought requisite that they be *practitioners* of learning. The seventeenth-century term 'natural knowledge' covered a wider range than the word 'science' was to assume after 1830 or thereabouts, and in this period the English-speaking world was still close to Continental usage, the Royal Society including far more than pure science within its range, just like the French Institut, or various German 'Wissenschaftlichen' societies and academies. The qualification of many a would-be Fellow of the first decade of the nineteenth century was that he was a member of the Society of Antiquaries or possessed wide literary knowledge; naturally the certificates of these candidates were signed by those Fellows of similar qualifications, while the more scientific members signed the certificates, more usually, of scientific candidates.⁷ Banks himself took a wide view, although he certainly preferred a candidate to be interested in natural science. As Benjamin Brodie (F.R.S. 1810, and a most eminent surgeon) later recalled, 'The view which Sir Joseph Banks took of the construction of the Society was, that it shall consist of two classes: – the working men of science, and those who, from their position in society or fortune, it might be desirable to retain as patrons of science'.⁸ And he instanced the occasion when Sir Everard Home (F.R.S. 1787) proposed as candidate a fashionable physician whom Banks refused to accept, although after the man inherited a fortune and a title Banks declared him to be acceptable as in a position to act as a patron of science. There were also some other groups whose members, like Croker and Barrow, were acceptable to Banks because they

were men in public life, and involved with affairs which might concern the Society.

Ordinary Fellows of the Society were hardly aware of any close connection with the world of affairs, for the regular meetings were intended for the reading of papers. Nor was this kind of business discussed at the Anniversary Meetings on St Andrew's Day (30 November), which were primarily devoted to the Society's private affairs. The President began these by analysing the state of the Society: Fellows deceased and Fellows elected, new Council members and any changes in the officers. He then announced and explained the award of medals: the Copley Medal, normally awarded annually, and, after 1800, the Rumford Medal, technically awarded every two years (in fact only thirteen times before 1846). The recipients between 1800 and 1820 are a very worthy collection of men of achievement.

The rise of new societies

One of the few deviations from the norm came in 1809, when Banks announced approvingly the formation of a Society for the Promotion of Animal Chemistry which had been conceived as having special links with the Royal Society, so much so that it was to be regarded as an 'associated' society, and all discourses read before it were to be offered for publication in the *Philosophical Transactions*. The minutes of the Committee of Papers show that a fair number of papers were offered by members in the period, mostly on the chemistry of animal secretions, and virtually all were published. Ironically, after this promising start the Society became little more than a dining club and soon died away. This is in direct contrast to the Geological Society which, begun in 1807 at the instigation of William Babington (physician and mineralogist, F.R.S. 1805) to raise a subscription to publish a French work on crystallography, continued as, essentially, a club, primarily interested in mineralogy.⁹ Then, two years later, the Hon. C. F. Greville (F.R.S. 1772) proposed that the Geological Society should become an associate of the Royal, a proposal which Banks naturally warmly welcomed, so much as to consider joining the Society. A formal plan for consolidating the Geological with the Royal Society, as an Assistant Society, was drawn up for consideration, very like what was being done for the Society for the Promotion of Animal Chemistry (probably under Banks's guidance). But the members of the Geological Society rejected this outright, resolving

that any proposition tending to render this Society dependent upon or subservient to any other Society, does not correspond with the

conception this Meeting entertains of the original principles upon which the Geological Society was founded.

(No doubt the notion of two classes of members, those who were and were not F.R.S., had a good deal to do with the rejection but the question of publication was also a thorny one.) Banks, receiving a copy of this and other resolutions, was indignant, but clearly the geologists were right to maintain their independence: they continued to have a thriving although not totally scientific or professional society, many of whose members were also Fellows of the Royal Society. But it must be added that a number of prominent members of the Geological Society, notably Roderick Murchison (F.R.S. 1826) and Leonard Horner (F.R.S. 1813), were to be active in attempts to revolutionise the Royal Society later on: had he lived to see it Banks would have felt justified in his prognostications of the evil effects of the creation of specialised societies. He had of course not objected to the formation of the Linnean Society, but that had been organised by a friend, and he himself had been active in it from the beginning, for it dealt with his favourite science, botany. His attitude to the Royal Institution seems to have varied: he had taken part in its foundation, and in 1820 John Herschel could declare¹⁰ that it was said that ‘the R.I. could at all times command a Secretaryship of the Royal Society’, but he seems at times to have shown some jealousy of its independence.

Banks’s disapproval was shown clearly and positively in 1820, the last year of his life, when the Astronomical Society was formed.¹¹ Then he actively interfered in its affairs, dissuading both the Duke of Somerset and Davies Gilbert from accepting the presidency. He apparently told Somerset that the new ‘Society will be *the ruin* of the Royal Society’, causing Francis Baily (F.R.S. 1821 and later Treasurer), one of the founders of the Astronomical Society, to remark drily that this was ‘no mean compliment to us, but not very respectful to that learned body –’. As Baily protested to Babbage,

It surely cannot be maintained for a moment, that, because a person is a member of the Royal Society, he is precluded from joining any other Society which has Science for its object: & after the fruitless and *more violent* attempt, which Sir Joseph made against the Geological Society, & the Royal Institution (and which only tended to unite more firmly the original members), I wonder that he should again endeavour to oppose the progress of science in this particular instance.

Banks had already tried to influence Davies Gilbert, who liked the idea of being president of the new society but frankly told Babbage

In the course of my short visit to London I have had an opportunity of ascertaining the opinion of several leading Members of the Royal Society, and I have [learned] not without regret that some degree of Jealousy is clearly to be entertained of our new establishment, so that it would be thought, by many Persons, a dereliction of duty, if their Vice President should take a leading part elsewhere.

But he firmly remained a member. It is true that among the founders of the Astronomical Society were many who disapproved of Banks and all his ways, especially the Cambridge coterie comprising Babbage, Baily, John Herschel, George Peacock (F.R.S. 1818) and William Whewell (F.R.S. 1821); they were to be outspoken critics of the Royal Society in 1830. But the Astronomical Society as such was to be no threat to the Royal, and in later years the two societies often worked harmoniously together.

The Council and its officers

Besides the quiet, even somnolent, weekly regular meetings of the Society there were some half a dozen meetings of Council every year, for even under such an autocrat as Banks the Council was necessary to the smooth running of the Society. For virtually all the Society's business, other than the reading of papers, was conducted by the Council, which dealt with both internal and external affairs, that is those which were properly the Society's concern and those in which it acted in response to government requests. Internal affairs concerned, first, the rights and obligations of the Fellows. There were requests for back numbers of the *Philosophical Transactions*, which then had to be collected from the Society's house; requests for postponement of admission; requests for copies of papers published in *Phil. Trans.*, or for their reprinting, or for the use of diagrams printed therein; requests for return of papers read but not printed (never granted, although papers in the archives might be copied); requests to withdraw or revise papers submitted before publication; requests to borrow books and instruments (permission depended both on the value of the item and the standing of the petitioner); permission for non-members to read in the Society's Library (always granted when the petitioner was known to some Fellow). The principal obligation of the Fellowship at large was the payment of dues, which in the early part of the century were still, as when the Society was founded, a shilling a week, with the possibility of compounding for a fixed sum at the time of admission; nevertheless members were often in arrears, and if more than two years elapsed without payment the Secretary had to be instructed to write to the erring Fellow threatening ejection.

Besides this routine business the Council had to consider and vote for the Croonian Lecturer (on the nature and laws of muscular motion),¹² the Bakerian Lecturer (by custom on a physical subject)¹³ and the Fairchild Lecturer (a sermon).¹⁴ The minutes do not record how those for whom the Council voted were chosen, but it seems probable that it was by Banks. There were also recipients of medals to be voted for: the Copley Medal (awarded normally annually since 1736 to the author, not necessarily British, of some important discovery or contribution), and the Rumford Medal, instituted by Count Rumford in 1796 for the most important discovery or 'improvement' in the study of heat or light (and extended to electricity) made during the preceding two years.¹⁵ The Council formally accepted (and occasionally rejected) the offer of portraits and busts of distinguished Fellows. It voted on housekeeping matters, like the painting and repair of rooms and their arrangement, and the appointment of servants such as porters and cleaners.

The Council also voted for the Treasurers and Secretaries, at least technically, although Banks's choice was paramount; Presidents continued to regard nomination as their prerogative, although later in the century their choice was sometimes rejected. Vice-Presidents, on the other hand, were always nominated by the President, and one of these was almost invariably the Treasurer. This was later to create friction, for the Treasurer was usually chosen for his business acumen, and this was not often accompanied by scientific distinction. Banks's Treasurers were Samuel Wegg (F.R.S. 1753), an antiquary, replaced on his death by William Marsden (F.R.S. 1783), an orientalist and numismatist who served until 1810 when he was succeeded by Samuel Lysons (F.R.S. 1797), a barrister and antiquary, like Marsden a distinguished scholar; he in turn was succeeded by Davies Gilbert in 1819, the first Treasurer since the seventeenth century to possess other than antiquarian interests and one who was to play an extremely important rôle in the Society's affairs until 1830. Gilbert, born Davies Giddy in 1767 (he changed his name in 1814 in consequence of an inheritance) was the son of a Cornish curate of good family who made money by investment and he himself was to marry more money; he early showed mathematical talent which he seems to have pursued at Oxford as best he could; he also became friendly with Thomas Beddoes to whom he later recommended his protégé, the young Humphry Davy. By the 1790s he was active in Parliament, soon to become an M.P. in the Conservative interest. But he was also attracted to scientific pursuits: he was thrilled at meeting Banks in 1789 and enchanted at being elected F.R.S. in 1791; soon after this he was engaged with such Cornish engineers as Trevithick and

Jonathan Hornblower in the development of high-pressure steam engines, an activity which lasted for twenty years. He seems to have been an able enough Treasurer, but his intense conservatism and his inveterate and innate irresolution were to cause grave difficulties for both himself and the Society in later years.¹⁶

Of the Secretaries at least one was a scientist in these years: E. W. Gray (F.R.S. 1779) a physician and botanist, one of the scientific staff of the British Museum, was succeeded in 1807 by Humphry Davy (F.R.S. 1803), now successfully established at the Royal Institution, and he in 1812 by Taylor Combe (F.R.S. 1809), a numismatist on the staff of the British Museum, who edited the *Philosophical Transactions* from 1812 to 1824; Joseph Planta (F.R.S. 1774), a librarian at the British Museum who had been a Secretary since 1776 was succeeded by the distinguished scientist William Hyde Wollaston (F.R.S. 1793) in 1804 (so that for some years both Secretaries were chemists); Wollaston served until 1816, to be succeeded in turn by W. T. Brande (F.R.S. 1806), a chemist at the Royal Institution, who served for ten years. The Foreign Secretary from 1804 to 1830 was Thomas Young (F.R.S. 1794) who re-established the intellectual and administrative equality of the position with that of the other Secretaries. Thus of the three Secretaries in the first twenty years of the nineteenth century at least two were scientists in the modern sense. All the officers were hard-working, as shown by exemplary attendance at Council meetings; indeed Wollaston attended faithfully even after giving up his Secretaryship.

The Council also voted approval in financial matters, both such regular items as salaries, the expenditure of sums to be paid (usually to one of the Secretaries) for translation of foreign papers and for indexing the *Transactions*, and for exceptional items like charitable assistance to the families of clerks, Assistant Secretaries, porters and even cleaners on death or superannuation.¹⁷ Although in this period the Treasurers' reports are not particularly business-like, they passed annual inspection by auditors (admittedly Fellows) as noted at the Anniversary Meeting each year. Indeed in 1800 it was found that the Treasurer had increased the Society's funds 'materially', so that after careful review of salaries it was concluded that they could safely be raised to keep pace with the loss in value of money since they had been fixed in 1743.¹⁸

Although the Council in this period does not on the surface appear to have concerned itself with the acceptance or rejection of papers for publication in the *Philosophical Transactions*, in fact it was entirely responsible for this important facet of the Society's public life. When the Society in 1752

took over the responsibility for publication of *Phil. Trans.* (for the previous sixty years it had been an official responsibility of one of the Secretaries, and before that a private enterprise of one of them) it established a Committee of Papers charged with all editorial decisions; and at this time, as for long, the Committee was composed of the entire Council, as the regulations revealed.¹⁹ The Council could ask for advice, being 'at liberty to call in to their assistance' any member of the Society; although the Committee does not seem to have availed itself of the possibilities of refereeing very often in this period, it met regularly (usually half a dozen times a year between January and July) and kept careful minutes which show that all papers received serious consideration, and by no means all the papers read at meetings were thought worthy of publication. Those rejected were usually either irrelevant or trivial: the Society never took seriously the seemingly endless stream of English and foreign papers and letters offering solutions to such problems as the trisection of the angle, the quadrature (squaring) of the circle or perpetual motion, although some hopefuls wrote in the belief that the Society offered premiums for such solutions; nor did it accept naive accounts of 'monstrous births' as mere objects of curiosity, science, as it was thought, having outgrown such 'lusus naturae', and the science of teratology not having yet come into being.²⁰

The Society as government adviser

There was thus a very reasonable amount of domestic business to occupy the Council, yet it composed what was only a very minor part of the Council's affairs, compared with the time and effort devoted to external affairs. For by 1800 the Society had been called upon from time to time for almost a century to advise the Crown and government departments, and this was to become more and more the case from 1800 onwards. Its most overt function of this sort was in connection with the Royal Observatory at Greenwich over which the Astronomer Royal presided, and to which since 1710 the Royal Society had acted as Visitors. Until 1830 the Board of Visitors, which inspected the Observatory yearly, consisted of the President of the Society and any Council members or Fellows whom he appointed. (In practice, the Astronomer Royal was always a member of the Council, so that by the early nineteenth century this was a matter of co-operation between the two bodies, rather than of control.) In fact, the Board of Visitors (as its reports to Council meetings show) served as an intermediary between the Astronomer Royal and the Board of Ordnance (and occasionally also the Admiralty) in matters arising from the need for new instruments and assistants, the payment of bills and salaries, and the

printing of the Greenwich Observations compiled (not always with perfect regularity) under the supervision of the Astronomer Royal.

Initially linked with the Observatory, having been founded in 1767 by the then Astronomer Royal, Nevil Maskelyne, was the annual *Nautical Almanac*, intended to facilitate the determination of longitude at sea by the method of lunar distances, a method much used from the late eighteenth until well into the late nineteenth century. This involved the drawing up of tables of lunar motion for the coming year and exact determinations of the positions of selected fixed stars – all of which exactly conformed to the purpose for which the Observatory had been founded by Charles II in 1675. It also conformed to the aims of the Board of Longitude, founded in 1714 and put under the Admiralty; since 1718 this had included *ex officio* the President of the Royal Society, the Astronomer Royal, three Fellows of the Society, the Savilian Professors of Oxford and the Lucasian and Plumian Professors of Cambridge – a formidably professional group for the time. Maskelyne worked happily with the Board, whose interests he shared, but after he died in 1811 and was succeeded as Astronomer Royal by John Pond (F.R.S. 1807) things went less well. Pond was a keen and accurate observer, who laboured to improve the instrumentation at the Observatory and ultimately, in 1833, published a very accurate catalogue of fixed stars, but contemporaries thought that he lacked theoretical ability, and certainly he was not interested in the practical problems of navigation and left the *Nautical Almanac* to assistants without sufficient supervision or encouragement.²¹ The situation is revealed in an exchange of letters between John Herschel and Babbage in 1814, when the young Herschel, still not certain whether to follow his father's profession, told his friend that he thought of applying for a post under Pond. Babbage wrote²²

I suppose you were not in earnest in what you said about the Nautical almanac. A less desirable employment you will not easily find out add to which, the situations are all occupied – It is an affair of *Patronage* in the hands of Pond, who (for what report saith) hath not proved the most eligible of Patrons.

This is perhaps not a very well reasoned criticism (Pond was, after all, technically responsible for the *Nautical Almanac*) and Babbage had already, with Herschel and Peacock, shown himself a fiery rebel against the Establishment, but the implications of the warning were almost certainly justified.²³

So notorious were the deficiencies in the *Nautical Almanac* by 1818 that, apparently at the instance of Davies Gilbert, the matter was debated in Parliament, at which time John Croker (F.R.S. 1810, with Barrow a

secretary of the Admiralty, and often on the Society's Council) declared it 'a bye-word amongst the literate in Europe' that required greater accuracy and closer cooperation with practising astronomers.²⁴ The Royal Society could thus be seen as instigating reform; it was also to take a larger share in the reformed administration, for the result of the Parliamentary debate was the formation of a new commission to assist and advise the Board of Longitude, now formally charged with the production of the *Nautical Almanac*. Besides the President of the Royal Society, the Astronomer Royal and the mathematical and astronomical professors at Oxford and Cambridge (all F.R.S.) there were to be three commissioners resident in London and three additional Fellows of the Royal Society: the first resident commissioners were Wollaston (no longer Secretary), Captain Henry Kater (F.R.S. 1814, an army engineer specialising in geodesy, soon to be on the Council) and Thomas Young (Foreign Secretary). As critics were soon to insist these, although all eminent scientists, were not specialist astronomers, but as London residents and active men they, and not the sometimes indolent academic astronomers who were there to advise them, were assigned most of the blame, and their supposed defects were ascribed to their representing the Royal Society.

It was not really surprising that it was the highly energetic and competent Thomas Young, arguably the most distinguished among the commissioners, who was appointed secretary of the Board, and superintendent of the *Nautical Almanac*. He tackled the job with vigour and ably corrected existing errors, but from the first he insisted that material of interest only to professional astronomers had no place in the *Almanac*, which was intended for sailors (and in any case he thought it extravagant to spend government money on such things). Instead, he published such supplementary material under the title 'Nautical Collections' in the *Journal of the Royal Institution*, to the annoyance of professional astronomers, who both disliked having to look in two places for information and felt that national prestige demanded that there be an exact British equivalent of the French *Connaissance du Temps*. The *Nautical Almanac* was, however, only one concern of the Board of Longitude, which particularly entertained and endeavoured to promote every sort of proposal for improvements in methods of determining longitude at sea. (It also acted as scientific adviser to the Government when requested.) A notable example was the move to establish an observatory at the Cape of Good Hope, a move which the Royal Society actively supported. Thus in 1820 Davies Gilbert wrote of being about to attend a meeting of the Board²⁵

When we have every reason to expect that the Establishment of an Observatory at the Cape of Good Hope will be formally

recommended to the Government and the first permanent introduction of Astronomy into the Southern Hemisphere may be considered as a commencement favourable to the Science of a New Reign.

The recommendation was indeed made, and the observatory established. But not even this success could silence criticism from astronomers, and agitation grew ever more intense from this period onwards, in a curious way reflecting on the Royal Society. For although the affairs of the Board of Longitude were peripheral to the interests of the Royal Society, the fact that its President was *ex officio* a member of the Board, and that so many commissioners were Fellows of the Society, inevitably linked Society and Board together in the public mind, for good or ill, and indeed the Board's business occupied a small but continuous amount of Council time.

Since the Board of Ordnance was well used to dealing with the Royal Society in connection with the Greenwich Observatory, it also turned to the Society for a certain amount of general scientific advice. In the 1790s the Society had assisted the Board in the planning and progress of the trigonometrical surveys then under way (especially in the matter of instruments), as well as advising on lightning conductors for magazines. In 1801 the Board of Ordnance asked for advice about the most suitable covering for the floors of powder works, to avoid danger of fire: as was already customary practice a committee was appointed, in this case consisting of Henry Cavendish, Charles Hatchett (F.R.S. 1797, not yet on the Council), with Rumford, Blagden and Gray being added later; all these except Gray, a Secretary of the Society, were experienced chemists, and Rumford knew a great deal about the practical aspects of gunpowder.²⁶ Two years later the Board of Ordnance sought advice about the cartridges used in cannon: these were normally wrapped in paper, and it had been suggested that various difficulties could be obviated by wrapping them in flannel – but how could the flannel be moth-proofed? On this occasion Banks showed a lack of judgement, for (perhaps thinking the matter urgent) he appointed as committee himself and the two Secretaries (Gray and Planta) – two botanists and a librarian, none of whom, as the report admitted, was at all knowledgeable about entomology.²⁷

Fortunately the membership of most committees was more suitable. So when the Home Office asked advice in 1814 in connection with the storage of gas in Westminster by the Gas Light Company (there had been a dangerous explosion of stored gas two years before at Woolwich) the committee appointed included a chemist, Smithson Tennant (F.R.S. 1785, Council member 1813–14), and an engineer, John Rennie (F.R.S. 1798,