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Scientists in the British Civil Service

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The current personnel policies and methods used in the British civil service for scientists are relatively recent in their development. Until World War I, relatively little scientific work was done by British government departments. The outbreak of World War I exposed the dependency of Great Britain on Central Europe for many products demanding high scientific skills and showed the need for more scientists in the government service. In 1916 the Department of Scientific and Industrial Research was set up to carry out research in its own laboratories, to stimulate the supply of scientists, and to encourage industry to undertake more research. Small numbers of scientists were also employed before World War I, and many more after, in the British Defence Departments.

Background

World War II gave a vigorous impetus to the development of government scientific work, resulting in a great increase in the numbers of scientists employed and also in the use of scientists as chief advisers to the government. The nation's scientific manpower was mobilized to help win the war, and large numbers of scientists and engineers came into government employment from universities and industry. Science became recognized as an important and continuing sphere of government programs. Key political and government leaders realized, also, from their wartime experience in recruitment, utilization, and general management of scientists, that a new charter was necessary for creation of a unified scientific service that would strengthen the attractiveness of a career in the postwar government service to high-caliber men and women.

The Treasury established in 1943 a small committee popularly known as the Barlow committee after its chairman, Alan Barlow, second secretary to the Treasury. Barlow, Edward Appleton, secretary of the Department of Scientific and Industrial Research (this is the premier scientific position in the British civil service), and a scientist representative from industry and one from Cambridge University composed the committee. The committee's recommendations for a stronger scientific civil service were divided into three main categories: condition of service, pay, and organization (*1*). Most of the recommendations were accepted by the government, which in some cases carried the proposals even further than the committee recommended.

The new organization reflecting these ideas was made effective in 1945. The main features of the resulting scientific civil service were as follows.

1) Better conditions of service were introduced to facilitate and stimulate research.

2) The status and salaries of scientists in the civil service were improved.

3) Three separate but interdependent classes were established to make up the scientific civil service: (i) the scientific officer class, (ii) the experimental officer class, and (iii) the assistant (scientific) class.

4) An interdepartmental scientific panel was established and charged with constant review of the efficiency of the scientific civil service and with the proposal of changes in organization or policies to promote the well-being of the scientific civil service.

5) Centralization of all recruitment for permanent posts in the scientific civil service was placed in the Civil Service Commission. A new commissioner was added to the Civil Service Commission to oversee this responsibility. This "scientist" commissioner has responsibility for directing the recruitment programs for the scientific civil service.

It should be noted that in the British civil service the term *scientific civil service* designates only those scientists and engineers who are engaged in research, development, and design activities. Engineers engaged in production, maintenance, surveying, and in such fields as civil, architectural, structural, and sanitary engineering are found in a separate classification known as the "works group of professional classes." The supporting subprofessional classes are in "technical grades." This article does not touch on these employees but describes only the scientific civil service.

Approach to Personnel Administration

The British civil service approach in personnel administration has several major features relating to scientists and engineers engaged in research and development. Some of these are closely related to the national culture and should be thus evaluated. A fundamental precept is that there are no political appointments in the British civil service. Provided that his qualifications are satisfactory, a man can rise to the most senior position. This nonpolitical character of the entire civil service is reflected in the severe restrictions upon British civil servants' engaging in political activities or making public utterances of an official nature. Differences of opinion that may be felt by a government science administrator will never be resolved in public statements. Other aspects, however, spring from British evaluation of their experience in recruitment, development, and retention of scientific personnel, and these aspects reflect a conscious desire to improve the vitality of the scientific civil service.

An example of the British national scientific personnel policy is the recognition of the special needs of scientific person-

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nel that is shown by the establishment of high-level scientific representation on the Civil Service Commission Selection Board, which is responsible for filling all permanent positions in the scientific civil service. The scientist commissioner, holding a post established in 1945, and the scientific section that reports to him devote their time exclusively to finding and selecting scientists and engineers for permanent appointment to the scientific civil service. The present commissioner and scientific adviser, C. P. Snow, formerly of Cambridge University, is recognized as a scientist.

This high-level emphasis on sympathetic understanding and administration of recruitment, examining, and selection programs fosters development of a close and harmonious working relationship between the scientific commissioner and the chief scientists in the departments that employ scientific, engineering, and supporting personnel. The interviewing panels that determine the suitability of all candidates are made up of senior scientists from the employing departments under the chairmanship of the commissioner or a scientist whom he may appoint to represent him. Therefore, the selection of scientific personnel is made within a vertical framework of commission and department cooperation with a scientist civil service commissioner as its policy head.

Organization

As already mentioned, the term *scientific civil service,* as used in the British civil service, includes scientists, engineers, experimental officers, and scientific assistants.

The scientific civil service has three principal breakdowns or classes. The first, the scientific officer class, which is the senior class within the scientific civil service, is recruited principally from first- and second-class university honors graduates. This class is the creative, initiating, and directing element of the British scientific civil service. It forms the spearhead of the scientific attack and is supported and aided by the other classes. Next is the experimental officer class, which is the main support of the scientific officer class; it is recruited both from university graduates and from men and women with technical training who have not completed university work. Experimental officers work under the general guidance of scientific officers, undertaking scientific responsibility frequently without detailed supervision. A member of the experimental officer class is normally one of a team working under the general guidance of a member of the scientific officer class. About 25 percent of the experimental officers have degrees. Those with significant achievement and promise of creative ability may be selected by a promotion panel of scientists for entry into the scientific officer class, but the standards are high and only a small number of such promotions occur.

The third class in the scientific civil service is the assistant (scientific) class. Its duties are to provide general assistance to the scientific officer and experimental officer classes: care and preparation of apparatus, observation of experiments and tests, and related tasks. The assistant (scientific) class would correspond generally to the categories of laboratory mechanic and technician in the United States civil service. Its members are principally recruited from persons who have an equivalent of a high-school education and who have had some training in mathematics or science.

In general, all these classes have fixed maximum age limits for recruitment to established posts. The upper age limit for appointment to the senior scientific officer grade is 31; for the scientific officer and assistant experimental officer grades, age 28; and for the experimental officer grade, age 30. For the last-mentioned grade, the upper age limit is at present waived for candidates who have had particularly useful experience.

Special facilities exist that permit regular ex-service officers and men to deduct their length of service from their age to enable them to have a "notional" age within the normal competition age limits. In this way, ex-service personnel can be recruited, and advantage is taken of this privilege especially in the experimental officer and assistant (scientific) classes.

The major employing agencies of scientific personnel, such as the Admiralty, the Ministry of Supply, and the Department of Scientific and Industrial Research, have scientific sections responsible for the internal personnel management of the scientific civil service. These sections reflect an organizational responsiveness to the special needs of scientists within the organization.

In the Admiralty, the scientific organization is known as the Royal Naval Scientific Service. The chief of Royal Naval Scientific Service is H. F. Willis, an eminent scientist and former head of one of the principal Admiralty laboratories. The superintendent of scientific personnel, who is a member of the scientific civil service, is the personnel officer for the Royal Naval Scientific Service, the staff of which is employed in the headquarters organization and in the laboratories. All proposals to the Board of Admiralty involving appointment, promotion, reassignment, transfer, and training are made by the chief of the Royal Naval Scientific Service or are delegated to the superintendent of scientific personnel. The personnel-processing, security, and other administrative functions, including the formal authorization of appointments, promotions, and dismissals, are executed by the establishment officer of the Admiralty. He is not in the Royal Naval Scientific Service, but he is responsible for the over-all administrative and personnel operation of the Admiralty.

This same pattern of organization exists in the Ministry of Supply, which is the largest employer within the British Government of scientific and engineering personnel. The chief scientist, Owen Wansbrough-Jones, is a top official of the Ministry of Supply. The director of technical personnel administration in the Ministry of Supply is responsible to the chief scientist and performs essentially the same functions as those described for the superintendent of scientific personnel in the Royal Naval Scientific Service. However, the Ministry of Supply does not use any special designation for its scientific corps.

Each major government department that employs a considerable number of different classes of scientific staff has its own scientific personnel section with responsibility for personnel management in the scientific service of that department.

An impression of the British scientific civil service widely held in this country is that all its members are in permanent positions with tenure and full civil-service perquisites. Actually, a large percentage of the employees in the scientific civil service, averaging in some departments as much as 30 percent of the total, hold temporary appointments without any tenure and are not under the civil-service retirement system. Temporary personnel may be appointed on sole authority of the departments, but in the event of reduction in force, they provide a cushion for absorbing the cut.

In 1955 there were 14,724 temporary and permanent employees in the scientific civil service. The scientific officer class had 3416, the experimental officer class 6030, and the assistant (scientific) class 5278 (*2*).

Role of the Treasury

Any discussion of British personnel policy must start with the role of the Treasury. There is no counterpart among U.S. departments and agencies to the British Treasury. It is the senior government department responsible for over-all personnel policies, staffing ceiling, and finance. Its functions are allied to those performed by the Bureau of the Budget, the Civil Service Commission, and the General Accounting Office in the U.S. Government. Through the Treasury's control of staffing for each department, it exercises a direct effect on the number of higher level positions to be established in any year and on the degree of promotion

expectancy and the rate of promotion. In its role as financial agent for the government, it determines the future of appropriations for current programs, expansion plans, and new research facilities.

Recruitment and Selection

The Treasury assigns to each agency a complement of "established" positions based on its needs for maintaining a firm stability for the permanent staff. The ratio of temporary to permanent appointments is therefore flexible.

Scientific and supporting personnel interested in employment in British civil service may apply for either of two kinds of appointments: (i) the "unestablished" or temporary appointment without tenure, which is made by the agency or department independent of age limits but is subject to the rules and regulations issued by the Treasury, or (ii) for "established" or permanent appointments obtainable only through open civil-service competition and conferring full civil-service privileges.

The government departments advertise constantly for all grades and kinds of scientific staff in the principal newspapers and appropriate journals. Applicants who respond are considered for temporary appointments. The Civil Service Commission also advertises its open continuous competitions in the principal newspapers and appropriate journals. Paid advertising has been considered an essential and continuing requirement during recent years.

As already indicated, special action may be taken if necessary to fill highly specialized or other posts for which suitable candidates are not available from existing staff. Posts at the intermediate level would be advertised (at appropriate grade and salary) by the Civil Service Commission in the usual way, with any necessary relaxation of normal age rules, and the process of selection would be as already described. In the case of the very highest posts, however, public advertisement is not favored. Instead, all government and other scientists of the required standing are considered by high-level scientists and administrators, working in conjunction with the Civil Service Commission, and the most suitable individual available would be invited to accept the appointment.

The selection of candidates for permanent appointment to the scientific civil service is based essentially on a critical evaluation of school or university records, work accomplishments, and potential for development. The procedure for selecting candidates for appointments in the scientific civil service has already been described. It is similar to that followed by the Boards of Examiners in the U.S. civil service. However, a major difference is that the British require a personal interview with each candidate. Candidates are invited for interviews only after the satisfactory conclusion of a basic review of their records and of the corroborative information obtained from references and other sources. Candidates who are invited to report for an interview receive their transportation expenses from the government.

Because selection for permanent positions is centralized in the Civil Service Commission, candidates need not apply for employment in particular departments. Assignment of successful applicants is made by the commission, with advice of agency panel representatives, to individual departments. All appointees must agree to accept transfer anywhere in the scientific service of the department (*3*).

Classification

Employees in the scientific civil service who are recommended for advancement at the periodical promotion reviews (which cover grades up to and including principal scientific officer and senior experimental officer) are considered by panels of their seniors. Promotion is usually to the next higher grade in the class but, as already mentioned, "class-to-class" promotions are also possible. By means of annual confidential reports, a regular and systematic appraisal is made of actual performance and potential of all classes of staff. The duties and responsibilities of the scientific staff do not affect promotion up to the level of principal scientific officer. The level of performance achieved and the promise that is demonstrated are the major criteria for promotion.

The scientific officer class has six grades: scientific officer, senior scientific officer, principal scientific officer, senior principal scientific officer, deputy chief scientific officer, and chief scientific officer. Entry of new appointees is normally to the scientific officer or the senior scientific officer grades. Promotion which is a change in grade is made only through movement to the next higher grade, such as from scientific officer to senior scientific officer. These promotions are initiated after decision by the reviewing panel of scientists. No change in duties and responsibilities is necessarily required, either before or after a promotion to the principal scientific officer or the senior experimental officer level. Normally positions at the senior principal scientific officer level and above carry a substantial measure of administrative responsibility. It is recognized, however, that there are scientists of marked creative ability whose advancement should not involve any break in their scientific work; in such cases, subject to the recommendation of a high-level selection board, the Treasury may approve promotion on "individual merit."

Although in theory no change in duties and responsibilities is necessary for a promotion, in fact, greater work responsibility usually accompanies the action. However, duties are described in broad terms such as "head of a branch conducting research in electronics" rather than in any detailed fashion. Classification, therefore, in the sense the word is taken in the U.S. civil service, that of placing a person in a particular grade after an objective evaluation of duties and responsibilities without major consideration of how these duties and responsibilities are being performed, does not exist for scientists in the British civil service. Instead, selection for promotion is made in recognition of employee accomplishment, personal development, and future potential; it does not give any major weight to difficulty-of-job factors in the scientist's current work assignment.

Generally, the career expectancy of the new appointee fresh from the university to a scientific officer position is to reach the principal scientific officer grade during his career; about one in six can be expected to proceed further. Promotion to this grade is achieved by demonstration of scientific ability and generally also requires administrative abilities as well.

There are, as already mentioned, a few posts in the senior principal scientific officer grade which are specifically set aside for scientists engaged on individual research and which carry no administrative responsibilities. Because the complement of the scientific civil service in each department is assigned by the Treasury in terms of a specific number of posts in each grade, vacancies in such grades or assignment by Treasury of additional positions at the higher grades must occur before promotions may be made. All posts of senior principal scientific officer and above are, in fact, individually approved by the Treasury, and no substantial alteration in their duties and responsibilities may be made without specific Treasury authority. Table 1 shows the distribution of personnel in the British scientific civil service by classes, grades, and salary ranges on 1 July 1955.

Professional Development

Training within the scientific civil service reflects a dependence on career development of personnel for future scientific leadership and accomplishment. Except for top laboratory or chief scientist positions, for which the whole scientific civil service may be combed to obtain the best individual available, or in the case of the need of a highly specialized scientist not found within the roster of the service, the higher positions are normally

filled by promotion from within. The need for continuing development of young scientists who are brought in at a young age in the scientific officer class creates a sensitivity among supervisory scientists toward their personal responsibility for providing both climate and policies that will lead to the maximum professional growth of the reporting staff.

Such techniques are used as attachment of junior scientists to those with greater experience; the rotation of assignment of scientists among the laboratories and headquarters staff, including occasional interchange with scientists in other parts of the British Commonwealth; the appraisal of each employee of the scientific service through annual confidential reports, both to determine his progress and to help to decide on promotion; the assignment of staff to universities or private laboratories for special training, and the participation of staff in employee development conferences. In addition, fellowships and attendance at staff colleges are also possible.

Role of the Staff Association

Employee-management negotiating machinery is very highly developed in the British civil service. There are negotiations between departments and recognized staff associations; negotiations through the national and departmental Whitley Councils composed of representatives of the government and of staff associations; and the existence of an arbitration tribunal in the Ministry of Labour.

Civil servants are encouraged to join the staff association that represents their particular occupational class (*4*). The large majority of the scientific civil service, including personnel in the highest ranks, are members of the Institution of Professional Civil Servants, which is one of the larger staff associations. The Institution of Professional Civil Servants has the right to consultation with management of a department or of the Treasury on proposals affecting their members. It also has the right to request arbitration on cases where no satisfactory agreement may be negotiated with the department concerned through the arbitration tribunal established in the Ministry of Labour. A member of the scientific civil service with a claim or grievance on promotion, working conditions, or related problems would ordinarily not handle the situation personally. He would submit his case to the local Whitley Council or to the Institution of Professional Civil Servants, which would then make an appropriate investigation and discuss the claim or grievance with persons on the appropriate management levels. The employee would normally accept as final the outcome of this negotiation, but has the right of appeal to the permanent secretary of his department and even to the Minister. Similarly, in any problems affecting the scientific civil service as a class, the Institution of Professional Civil Servants would be the agent for proposing and negotiating a remedy.

Table 1. Personnel and pay in the British scientific civil service (*5*). The fraction ½ in the "Personnel" columns means that administrative arrangements give certain individuals some of the advantages of the higher rank.

Position	Personnel			Annual pay (£)
	Established	Temporary	Total	
	Scientific officer class			
Posts above chief scientific officer	19	3	22	4500 3750 3250 2850
Chief scientific officer	33		33	2600
Deputy chief scientific officer	113½	7½	121	2050–2225
Senior principal scientific officer	388	17½	405½	1700–1950
Principal scientific officer	1128	107½	1235½	1245–1595
Senior scientific officer	807	104	911	1070–1245
Scientific officer	390	298	688	513 10s–925
Total	2878½	537½	3416	
	Experimental officer class			
Chief experimental officer	46	2	48	1355–1595
Senior experimental officer	1198	85	1283	1125–1325
Experimental officer	2552	397½	2949½	790–960
Assistant experimental officer	1268	481½	1749½	320 10s–700
Total	5064	966	6030	
	Assistant (scientific) class			
Senior assistant	938	84	1022	605–815
Established assistant	1674		1674	280 10s–575
Temporary assistant		2582	2582	240 10s–523 10s
Total	2612	2666	5278	

Retirement

Retirement in the British civil service is set up on a noncontributing basis. Upon reaching the minimum retirement age, normally 60, an employee who has had at least 10 years' service may retire with a pension calculated at the rate of 1/80 of his average annual salary during the last 3 years of his service for every completed year of service, subject to a maximum of 45. In addition, he receives a tax-free lump sum calculated at the rate of 3/80 of his average salary for every completed year of service. For example, a man with 40 years of experience would retire at half the annual pay of the average of his last 3 years of employment, and in addition he would receive a tax-free lump sum payment of 1.5 times his average 3-year salary.

Evaluation

A broad evaluation of the advantages and disadvantages of British civil service policies and methods for management of the scientific and supporting staff shows the following positive values:

1) Sensitivity toward the special personnel requirements of creative scientific research work exists at top management levels in the British Civil Service Commission and in the employing departments. This is reflected in the organization of the departments and of the Civil Service Commission, whereby they give full consideration to recruitment and management of scientific personnel.

2) Members of the scientific civil service regard themselves as a separate corps with their own leadership. This enhances their morale and prestige. Scientists have a voice in recruitment, promotion, training, and matters of working conditions. Harmonious working relationships exist between the Civil Service Commission and the employing departments.

3) There is consistent and uniform application of the principle that scientists and their accomplishments may only be properly and acceptably evaluated by their peers. This is the basis for the use of a panel of senior scientists in major administrative areas. This panel is used to advise authoritatively on suitability for permanent appointment, to decide on promotions to higher grades, and to select candidates for appointment from within the service to the scientific officer class.

4) Channels of communication for discussion, understanding, and solution of personnel problems exist at all management levels between the staff and the top management of the employing departments. First, the top reporting relationship of the chief scientist of a department and his dual role as the spokesman for the unified scientific service of which he is the chief within the department are major factors in obtaining top-level con-

sideration of significant personnel needs. Second, the Institution of Professional Civil Servants, a staff association that is officially recognized by the Treasury and by the departments, acts as a representative spokesman and negotiator for the scientific staff as a whole or for individual scientists, on any policy, practice, or problem requiring top-level decision by the head of the department, by the Treasury, or by Parliament. If necessary, the Institution of Professional Civil Servants may carry a case beyond the Minister to an arbitration tribunal set up in the Ministry of Labour. Third, the national and departmental Whitley Councils on which representatives of the employees—the "staff side"—and the representatives of top department management—"the official side"—meet to discuss and to decide on policies and practices affecting more than one occupational class of the civil service provide a clearing house for problems.

5) The tax-free substantial lump-sum payment at retirement and the noncontributing retirement system effective after 10 years of service at age 60 create a strong incentive for senior scientists to remain in the service.

6) Full recognition and use is made of policies covering fellowships, training at government expense at universities, encouragement of attendance at professional meetings, and paid advertising of vacancies in newspapers and journals.

7) The establishment of a policy that individual scientists with creative research talent may rise to top positions without administrative or supervisory responsibilities and assignment of complement for that purpose is an excellent incentive.

8) The interdepartmental scientific panel, which is composed of top scientists and establishment officers of the administrative class who represent their departments, as well as representatives of the Treasury, in overseeing the welfare of the scientific civil service and in promoting acceptance of government-wide policies that will improve the service is a major factor in assuring continuity of progressive policies.

Although the purpose of this report is to suggest that British experience might include concepts applicable to the management of scientists in the United States, it may be relevant to point out certain disadvantages from the American point of view of the British scientific civil service. These should, of course, be evaluated in the light of the very marked cultural differences between the two nations.

1) The promotion rate is considerably slower than it is in the United States. It is considered that an outstanding scientist will reach the grade of principal scientific officer in his early 30's or from 10 to 15 years after his entrance in the service two grades below.

2) The stratification among the three classes in the scientific service is sharply defined and reflects to some extent the national educational system. Opportunity for mobility upward toward the scientific officer class is limited, although it should be noted that the normal educational qualifications are waived in the cases of those who are promoted from class to class.

3) The rigid maximum age limit for entry into the scientific officer class makes it impossible, except in special cases, for individuals over 31 with the necessary scientific attainments to obtain permanent posts in the government service. However, as has already been noted, they may obtain temporary appointments and have the benefits of a special contributory super-annuation scheme. There are no such restrictions with regard to the other two (lower) classes, but it will be evident that there is a marked tendency in the United Kingdom to expect the young scientist to decide very early where his career lies and not to give him any great facilities for changing to government service after he has reached the age of 31.

4) The salary scales for the top positions in the scientific class are not at a parity with top positions in the administrative class. This places the scientific civil service in a position secondary to that of the administrative class in the civil-service structure and culture.

In summary, there are many areas in the management of scientific personnel where the British have made valuable progress to be noted by other public civil-service systems that employ scientists. In common with the public service in other countries, many pressing problems constantly face them in their struggle to obtain and keep a fair share of creative scientific talent in the face of a national shortage of supply. The British civil service is alert to this challenge and continuously strives to meet it through a personnel system that features careful selection, professional development, and development of trust on the part of those who are members of the service in the major administrative decisions as made by their fellow scientists.

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Uptake and Turnover of Calcium-45 by the Guppy

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The possible contamination of marine and fresh water supplies with radioactive materials was forcefully indicated following the 1954 atomic bomb tests carried out in the Pacific islands. Although the prospect of wartime contamination from detonation of atomic weapons is remote, accidental pollution of water supplies may occur during efforts to dispose of radioactive by-products from peacetime usage of radioactive materials. Contamination of water supplies may also result in the accumulation of radioactivity in food fishes. Such accumulation may adversely effect the nutritional economy and medical status of the world's population.

Andrews (*1*) has recently indicated that if the fission products of a nominal atomic bomb were mixed into the water of Lake Mead, an individual would have to drink 50,000 cubic feet of water to reach the tolerance value for strontium-90. However, if one assumes that fission products from waste effluents or bombs are not evenly distributed but may be concentrated in relatively local areas of the oceans or of bodies of fresh water for a given period of time, an entirely differ-

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