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THE SCOPE FOR ACTUARIES IN LOCAL GOVERNMENT SERVICE

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ORGANIZATION is a problem of analysis and its converse, synthesis. It involves first the exact determination of the separate elements to be co-ordinated, whether these be sources of supply, processes of manufacture or divisions of administration. Secondly, these elements must be translated into the appropriate functions which they necessitate; for example, specialized branches of labour or steps in accounting procedure. Finally, the separate functions must be integrated into a coherent pattern, sufficiently stable to be economical of effort while remaining sensitive to changes in any of the basic circumstances with which the plan has to deal.

Whether it be a question of selling deaf aids or supplying armies or repairing roads, the plan of action must be preceded by fact-finding and the careful arrangement of the facts in relative importance to the problems under review, the assessment of time factors and secular trends, the forecast of emerging quantities, the skilful balancing of compensatory factors. The more complete these processes the more easily is the plan derived. Subsequently the construction of the plan, the final synthesis of functional components, is a task calling for breadth of vision, a capacity to visualize the pattern of action in its entirety without being distracted by detail and an appreciation of all that is involved in the relation between the plan and the problem which it is to solve—an ability to keep the formula flexibly linked to the material from which it derives.

It is precisely in these procedures that the skill of the actuary may be most effectively exploited. In recent years both Government and industry have discovered that, either directly acquired as part of the curriculum of training or indirectly inculcated by virtue of the type and breadth of logical practice in the hard years of probation, there are qualities possessed by the actuary that adapt him peculiarly for the higher levels of executive responsibility. Actuaries who have entered industrial undertakings on specialist grounds have been called upon to accept wider authority within a short time.

If this is true of organization generally it is especially applicable to local government, where, since political issues less frequently predominate, 'government of the people, by the people, for the people' approaches more closely to practical reality and, because it must by its very nature embrace a wide variety of types of person and of personal needs, creates an ever-insistent problem of achieving the difficult marriage of simplicity of organization to a complex network of functions. Since in this field the broad qualities of the actuary might find boundless scope of application, it is almost a stultification of the profession to specify particular technical roles. Yet tangible examples are to be preferred to less definite outlines of wider administrative scope. If, therefore, I tend to confine my remarks to specialist activity, let it be remembered that a wider field remains.

THE NEED FOR STATISTICS

Every department of a local authority should sustain statistical research, for local government is a community business and it cannot operate without having continually available an accurate picture of the community and their communal needs. The Council and its officers should be sensitive to the day-to-day changes in this picture to the extent allowed by the legislative framework in which they function. An almost imperceptible drift of industry may in a short time produce an acute town planning problem, changes in the birth-rate may bring housing or educational difficulties. There is no need to multiply examples. The local authority must have a thorough knowledge of the material with which it has to deal. Yet there must be discrimination. Experience shows not that local authorities collect too little information but that they often collect too much. Unappreciative of the need for technical advice, many authorities allow each and every small section of the administrative machine to collect returns and keep records with rarely any check as to whether the information is already available elsewhere or whether the records are designed to produce the essential facts with the least expenditure of labour. There is frequently inadequate inter-sectional liaison. The result is that there is considerable wastage of labour involved both in the use of individual returns and in their overlapping with other returns. Paper work multiplies and the public or the officials on whose co-operation the accuracy and promptitude of the information depend become alienated. An actuary let loose on paper work alone could be invaluable.

FINANCE DEPARTMENT

It is an unfortunate fact that the poorer localities are those which require the more extensive services so that the greater local expenditure falls upon those who are less capable of bearing the burden. To meet this difficulty the central government either makes direct *ad hoc* grants for special services, e.g. education, or provides a 'block grant' to equalize the local expenditure by giving more assistance to the poorer than to the richer areas. These block grants are provided from a pool of moneys derived from national taxation and are calculated by a formula which takes account of population, proportion of children under five, degree of unemployment, sparsity of population, and rateable value per head. It follows that an authority must keep these factors continuously under review in order that it may protect its interests when block grants are periodically revised (every five years). On the general question, too, of central versus local charges there is bound to be a tug of war between central legislature and the local authorities; the better informed are the authorities, the more cogent will be their arguments. There is a very great need for research into the whole structure of local government finance and for the examination of differential levels of valuation.

With regard to local expenditure, it will be obvious that the authority neither meets its liabilities nor receives its rate income on one particular day in the year. The financial transactions are continuous, and arrangements must be made to regulate income and expenditure so that there is always money in the till, i.e. a working balance or a carefully calculated scheme of temporary borrowing or financing by overdraft to meet current commitments. Furthermore, the authority cannot wait until its liabilities have matured before it levies a rate. It has to ask for the money in advance. It is of course a legal

obligation that a budget must be prepared and an estimate made of future liabilities. The task of preparing these estimates begins with the spending departments which furnish statements of the services they expect to maintain and the probable cost. The statements are then examined by the Finance Officer. It does not need an actuary to prepare these estimates, but it may often be desirable to find some approximate rule which will enable these estimates to be checked by the finance department without the need for detailed recapitulation of the original calculations, and here the actuary may be able to find the answer by his ready recognition of the more powerful variables.

Reverting to the question of reserves, although a cash balance is necessarily carried by a local authority it is not withheld from the ratepayers indefinitely but is of course taken into account in fixing subsequent rate requirements. For financing capital expenditure it may however be necessary at certain times for these cash balances to be augmented in order to bring the liquid resources of the Council to a level required for the repayment of maturing debt or for meeting new capital commitments without recourse to borrowing. At other times, according to the trend of interest rates, an entirely contrary policy may be necessary. A local authority can never become bankrupt but the maintenance of the appropriate degree of fluidity in its assets coupled with stability in the rate levied is an important undertaking requiring careful and expert adjustment.

We turn now to insurance problems. The actuary looking for 'normal' insurance activity will find little enough to occupy him. Local authorities can obtain powers by local Acts to underwrite a wide variety of risks, e.g. damage by fire, burglary, plate glass, workmen's compensation, certain types of accident, boilers, livestock, cash in transit, third party indemnity, vehicle driving, etc. Most authorities who have obtained powers cover only workmen's compensation and fire risks. It is usual to impose limitations on risk by requiring the authority to reinsure with a recognized office, the proportion to be reinsured decreasing with the growth of the fund. It is generally recognized that it is impracticable for smaller authorities to establish funds of their own, but doubtless much could be done by larger authorities or combinations of authorities. The whole matter is not thoroughly understood by the average chief officer of a local authority. There is great scope for technical advice of a general, as well as actuarial, nature from expert quarters.

Many tasks are specified in this paper for which actuarial training is desirable or confers an added advantage but it can be argued that there is only one task for which it is absolutely essential, viz. the valuation of a superannuation fund. Under the Local Government Superannuation Act, 1937, every local authority having more than 100 employees of the contributory class must, either on its own or in combination with other authorities, maintain a superannuation fund. Many authorities already had funds under the Local Government and Other Officers' Superannuation Act, 1922, an adoptive act. There are certain authorities who had previously instituted funds under local Acts and they were required to modify their schemes in the interests of uniformity. Beyond emphasizing the extent of this field it is, of course, unnecessary for me to go further, for the need for actuarial advice, not only in the valuation of funds but in aspects of the conduct of superannuation schemes, is widely recognized and nearly all authorities employ consulting actuaries. It is possible that they could put them to fuller employment with advantage

by more frequent consultation on such matters as, for example, investment of funds. Should the fund be invested in outside statutory securities or advanced to the local authority against sanctioned borrowings? There are differences of opinion on the question of internal or external investment. Internal investment saves stamp duties and expenses and avoids capital depreciation risks, but removes any possibility of profit by realization. Which is likely to achieve the higher rate of interest in the long run? It is important too that there should be early consultation on such matters as variation in interest rates or changes in salary scales or the creation of new posts.

The actuary is hardly concerned with accounting procedure but there is scope for statistical research in the organization of internal audit and financial control. The recapitulation of accounting transactions and calculations can be laborious and costly. How far is it necessary? It should be possible by sampling experiments to devise a system of checks for any particular branch of work as will ensure error being restricted to an agreed permissible margin.

Many local authorities find it necessary to make costing analyses, e.g. cost of road maintenance per mile, cost of electricity per unit of power produced by a local electricity undertaking, or unit costs in transport undertakings. This operation is properly the function of the local accountants or of other technical officers and it is not suggested that cost accountants should be actuaries or would commonly need actuarial assistance, but at top level in the organization of costing procedure there may occasionally be statistical problems of a more complex nature where consultation with an actuary would be advantageous.

HOUSING AND VALUATION

A local authority largely subsists by levying a rate on property in its area and it is obviously essential that it should possess intimate knowledge of the rateable values involved. Accurate assessment of these values is of course the function of the Valuation Officer and it is not proposed to trespass in this field but there are cognate problems of a statistical character in the solution of which actuarial advice might prove valuable. Changes in the relative values of different types of property are made by quinquennial adjustments in the valuation lists. In so far as these adjustments are determined by changes in the economic structure of the nation as a whole, it should be possible to discern the direction of movement and to make financial assessment of differential trends and values. There are other changes. New properties appear and older properties are rebuilt or demolished. This is a constant movement expressing the expansion or contraction of local industries, movements in the dormitories of the population, new fashions in entertainment or the broader redistribution involved in long-term planning. The planning of capital expenditure already referred to also entails the analysis of these changes. Considerable research is necessary which will in any case be laborious but which, if adopted under expert direction, should secure high efficiency, i.e. the derivation of the maximum knowledge from the minimum data.

The town council's interest in property is not confined to rateable values alone. The council is commonly not only the direct provider of housing accommodation but also exercises considerable central control over private building within its area. At the present time the local authorities are facing a tremendous accumulated demand for dwellings arising from the cessation of normal building during the war years and acutely aggravated by war

damage. The short-term problem is to marshal all available resources by the requisition of unoccupied property and the provision of temporary bungalows, and the allocation of this immediately available accommodation to those in need of it. How are priorities to be measured? In grading applicants consideration must be given to whether their existing living conditions are unhygienic and to occupation and necessity for living close to place of employment. Account must be taken of size and age and sex distribution of family, illness or incapacity of other members of the family, etc. There is scope here for an ingenious system of numerical rating. In any case some means must be found of selecting, for a unit of accommodation of a particular nature, the candidate who, judged by criteria which have the sanction of general agreement, is to be preferred to all others; much thought must be given to the arrangement of facts in such a way that this selection can be accomplished rapidly. Specialized advice as to the most appropriate form of card index or as to the application of punched card technique would appear to be called for.

The present pressure exerted to make local authorities engage in building operations on their own account with direct labour will raise problems of supply and of control, e.g. costing, which will normally be handled by building and allied technicians, but there may be scope for analytical treatment of rates of absorption and distributive processes of materials in order to prevent bottlenecks.

Where the municipal body is charged with the formulation of a long-term town planning scheme, considerable statistical research is involved. What size and what nature of population will the plan have to cover? Flats or houses? What industrial set-up is likely? How many schools, hospitals, cinemas, shops or sports grounds? What are the transport requirements? The proposed 'decanting' of population from congested areas involves the preparation of local services and employment where they are to be settled. The following figures in respect of an out-county site which the L.C.C. is just commencing to develop illustrate the type of plan which must be devised:*

	Acres	Percentage of whole area
For houses	325	57
For school sites	94	16
For industrial etc. development	62	11
For open spaces	42	7
For private housing (better-class houses to secure 'mixed' development)	18	3
For community purposes (preservation of mansion, etc.)	17	3
For shops	6	3
For churches	5	
For main road widenings	3	
For miscellaneous other purposes (cinema, refreshment houses, estate office, etc.)	4	
	576	100

The actual fact-finding, though laborious, is not difficult, but the final correlation of the information and the inferential processes call for a high level of skill.

* Wood, A. R., *Housing Finance and Accounts*, I.M.T.A. Lecture, No. 6, 1946

EDUCATION

The Education Act of 1944 has placed a heavy load of responsibility upon school authorities, who now have to provide educational services from the nursery to the adult stage. The system of public education is to be organized in three stages, (*a*) primary, (*b*) secondary, and (*c*) further education. The school-leaving age is to be raised ultimately to sixteen. It is the intention to provide three types of secondary schools, 'grammar', 'technical' and 'modern'. Apart from actual education other services are to be provided, e.g. boots and shoes in necessitous cases, school meals and milk, medical inspection and treatment. The numbers emerging year by year in any particular category will be sensitive to short-term fluctuations in fertility or in employment conditions and, to maintain an economical balance between the different branches of education, forward planning is necessary. The problem is akin to that of constructing a social insurance scheme based upon contributions from a wider public than the beneficiaries and providing benefits which, though non-material, are adapted to economic needs and necessitate the setting up of adequate reserves of labour and equipment. Too often in the past the planning has been in reverse and the service has been restricted by arbitrary resources instead of the resources being adjusted to projected need.

SUPPLIES AND MUNICIPAL TRADING

Most of the larger authorities engage in commercial activity of some kind, whether it be the bulk buying of such commodities which, being common to the requirements of many branches of its service, may be more cheaply obtained by such practice or the direct conduct of such utilities as gas and electricity plants, public transport, or British Restaurants. Some authorities engage in farming activities on an extensive scale. Such actuarial problems as arise are not fundamentally different from those encountered in normal practice. Fundamentally, if the problem is one of analysing causes of fluctuation, regulating future resources to emergent need, constructing decrement tables, discounting changes in basic quantities or any of the many facets of actuarial training, then it does not matter whether pensions, insurance, commodities or social services are involved, the basic problem and the approach thereto are unchanged.

Where the municipal authority is supplying gas or electricity, or maintaining a transport undertaking, then there is clearly scope for the statistical treatment of such things as peak loading, efficiency (as determined by actual output of energy to materials consumed), the installation and maintenance charges per unit of gas or electricity consumed, and tariff. Where there is actual production of other commodities or where there are central purchasing transactions, the adequate provision for fluctuations in supply and demand may give rise to problems in multiple correlation or other aspects of market research. In matters such as these the local officials, accountants, engineers, etc., are expert, but there may be times when it is difficult for them to see the wood for the trees and there is scope for independent consultation. In many instances it is not the problem itself but its recognition that demands skill. This is true of much actuarial experience.

PUBLIC HEALTH

No physician would attempt to diagnose the cause of illness without seeking information of age, history, environment, signs of circulatory, respiratory or other disorder, with all the available assistance from radiology and pathological tests. He must have as complete a picture as possible of the departure from normality. The differential diagnosis of a disease that has symptoms common to other diseases is an exercise in exact observation. As much and more is true of social medicine, and the Medical Officer of Health cannot organize preventive services without the same scientific observation, on a macroscopic scale, of the community with which he has to deal.

The first requirement is an analysis of the local population by age, sex, housing density, occupation and economic status. The census volumes give this information, but at decennial intervals only, and since the distributions are constantly changing, often imperceptibly but sometimes violently, it is necessary to obtain supplementary data, either by direct sampling where practicable or by making use of facts thrown out indirectly as a by-product of samples undertaken with objectives unconnected with public health. For example, a local sampling inquiry on food distribution may give records of size of family or of social status. The statistician must snatch at all straws.

The next requirement is the measurement and continuous scrutiny of all available health indices—fertility, maternal mortality, infant mortality, the attack rates and case mortality of infectious diseases, death-rates for other specific diseases, hospital admissions, results of miniature radiography, the progress of immunization campaigns, height and weight measurements and medical inspection of school children, etc. There are pitfalls here for the unwary. The real incidence of tuberculosis may remain stationary, but the efficacy of mass miniature radiography in revealing unsuspected infection, or the inducement to secure extra milk, or the financial assistance provided by recent legislation, may lead persons to seek treatment (and notification) who would otherwise not claim the attention of the health authority, and a rise in notifications takes place. The present nursing shortage has so restricted hospitalization that recorded admissions do not embrace all those *requiring* institutional treatment, but only those who are fortunate enough to obtain it.

In 1940 the Registrar-General made two changes in the classification of deaths. The combined effect of these changes for some principal causes of death was considerable, as the following figures show:

Cause	Approximate change as a percentage of those formerly assigned to this cause
Influenza	− 11
Cancer	− 3
Diabetes	− 30
Heart disease	− 10
Other circulatory	− 6
Bronchitis	+100
Pneumonia	+ 5
Other respiratory	+ 50
Nephritis	+ 12
Diseases of pregnancy, etc.	+ 10

The rules of precedence hitherto applied to joint causes of death were abandoned in favour of the opinion of the certifying doctor. At the same time,

in respect of all deaths and in accordance with international agreement, the 5th revision of the International List of causes of death was adopted.

The evacuation of children at the outbreak of war and during subsequent periods of heavy bombardment completely upset the normal rhythm of measles incidence and affected the epidemiology of other infectious diseases. These examples illustrate the difficulty of maintaining indices on a comparative basis over a long term.

In respect of some health factors the traditional index is demonstrably inadequate and the improvization of indices more closely related to the effects it is desired to measure offers a challenge to the skill of the statistician; though in this field, as indeed in most aspects of social medicine, the mathematician cannot hope to work successfully without first appreciating the biological background, and must be prepared to work as a member of a team together with clinicians, pathologists, and other medical workers. I may illustrate this point in relation to nutrition. For many years the Ministry of Education has required the school doctors to classify the nutritional state of children in four categories:

(1) Above normal.
(2) Normal.
(3) Slightly subnormal.
(4) Malnourished.

A comparison, from time to time, of percentages in these categories is regarded as indicating changes in the average adequacy of nutrition; which is precisely what it does not do. For provided the dispersion remains constant changes in the norm (i.e. the mean level of nutrition) will leave the percentages unchanged. The following figures for a sample group in London make this clear.

Seven-year-old boys

Year	No. of children	Mean height (cm.)	Mean weight (kg.)	Percentage 'subnormal' or 'malnourished' (groups 3 and 4)
1938	3873	117·4	22·53	11·6
1943	1606	117·2	22·35	9·5

The percentage below the normal nutritional state is less in 1943 than in 1938 despite the deterioration in physique (statistically significant).

Obviously a closer assessment of nutritional changes might be obtained by reference not to such an arbitrary classification but to skeletal measurements or weight records which will reflect the nutritional state. Many indices on such bases have been devised but none is entirely satisfactory, and the problem still awaits solution mainly because there is as yet no general agreement as to the combination of measurements that can be held to determine a 'healthy' child. Health is as difficult to define as truth.

The movements of the various indices throw light not only on the adequacy of preventive measures and the need for reinforcement of these measures but they also reflect changes in social behaviour and periodic fluctuations in the virulence of infections. The Medical Officer of Health must rearrange his forces to meet transformations in the pattern of attack of disease.

The weapons with which the battle of health is waged must be continually

improved and research is constantly proceeding. The statistician working as part of a team with experimental biologists will be called upon to solve many problems not only in the analysis of experimental results but in the actual design of experiments.

Professor Greenwood* has recently drawn attention to the wide field still open for statistical research in epidemiology. The laws governing pandemic outbreaks of disease are still largely unknown; 'the riddle of the epidemiological Sphinx is still unread', and much experimental work is required. A great deal of material already exists in the files of local health authorities and awaits analysis.

In relation to specific disease it is possible for erroneous impressions or prejudices as to the relative importance of various social and physiological factors to persist and only thorough tests of partial correlation can indicate major causation.† This kind of investigation is important as it may profoundly affect the organization of preventive services.

On the treatment side the results of controlled experiments at the health centres or hospitals will have to be assessed statistically, and interesting problems in the analysis of variance often arise. The growing volume of this sort of work has led, in Scotland, to the establishment of the Scottish Bureau of Statistical Research under the joint auspices of the University of Edinburgh and the Faculty of Actuaries. There is a danger that unsuspecting clinicians may employ insufficiently qualified persons who claim to be 'statisticians' and who either produce incorrect results or fail to make the most of the data through using the wrong technique.

PROPOSALS

An attempt has been made to outline some of the tasks which could be entrusted with advantage to those who have undergone actuarial training. The account is not exhaustive nor is it claimed even that all the important actuarial aspects of local government have been covered. Some of these are still unexplored and await discovery by enterprising actuaries who enter the field. There is no clear-cut beginning or ending to the work an actuary can or should do. It is clear, I think, that there are opportunities for service.

What should be done to bring the man and the opportunities together? On the whole, local authorities are reluctant to recognize specialist qualification except in such traditional spheres as, for example, architecture and law. An accountant is not looked upon as an accountant *per se* but as a clerical officer of a particular grade in the Finance Department and often, in theory, is regarded as interchangeable with officers of the same grade in any other department. Actuarial qualifications are not understood. It is for the actuary to demonstrate his own distinctive qualities; if the local authority is sufficiently enterprising to make good use of these qualities he will be adequately rewarded.

Local government bodies range from regional boards and county councils down to rural district councils. Not all of them maintain the services I have described. A county council or county borough council could keep an actuary fully occupied to advantage in one aspect or another of its

* Greenwood, M., *Proc. Roy. Statist. Soc.* 1946.

† See, for example, Daniel, G. H., *Social and economic conditions and incidence of rheumatic heart disease, Proc. Roy. Statist. Soc.* Vol. CXI, p. 197, 1942.

administration. Municipal boroughs and smaller authorities could not justify the employment of a full-time actuary, but there will be many occasions when actuarial advice would be invaluable if it were available on economic terms and there is scope for the building-up of a consultant practice. I feel sure that if such a consultant service were available and were appropriately brought to the attention of local authorities the demand would gradually grow. Actuaries have an opportunity for extending into a new field their tradition of public service but all such ventures call for pioneers and the profession must find them.

I wish to emphasize that the opinions expressed in this paper are personal only, and that the London County Council bears no responsibility for them.

ABSTRACT OF THE DISCUSSION

Mr F. H. Spratling, in opening the discussion, said that the author had discussed the case for the employment of actuaries in local government service, and had illuminated his argument by an impressive series of examples drawn from classes of work which the actuary did not usually touch. Yet the common feature linking those varied problems was the actuary's ability to make a distinctive contribution to the solution of each of them, and to do so without usurping the functions of others, chiefly the specialists in the different fields. The paper was in direct succession from F. A. A. Menzler's paper of 1925 and E. W. Phillips's of 1927. While the subject of professional scope was one which had frequently been debated by members informally, it was the more surprising that it had not occupied the attention of the Institute at a sessional meeting since 1927. Progress in those years towards enlargement had perhaps been slow, but it had at least been steady, and in recent years the pace seemed to have quickened. The rebel and the pioneer of the 'twenties were entitled to some personal satisfaction that the seed they had planted was yielding fruit in the 'forties.

Very wisely, the author had said little of the few normal professional tasks which arose in local government service. He had concentrated on the unfamiliar, but it was, perhaps, worth devoting attention to certain ways in which the professional skill of the actuary could be directed to matters within its normal scope in the service of a large organization, including private enterprise on the grand scale as well as public authorities and newly nationalized industries. With regard to pensions, for instance, there would be problems of scope (i.e. what sections of staff should be brought within the ambit of a particular arrangement), of methods of finance and investment policy, of interest guarantees and guarantees of solvency, of adapting existing schemes to meet the special circumstances of new classes of member, and of adapting existing schemes to meet new conditions such as those created by the passing of the National Insurance Act of 1946. To all of those the actuary had an obvious contribution to make.

The actuary, as such, would not normally be charged with the framing of policy, but he would be expected to give expert advice in such a form that the policy-makers could take decisions with a clear understanding of their implications. Quinquennial valuation reports in conventional form, and sometimes formal estimates of emerging cost, had their place, but the need of the policy-makers was more often for a well-turned memorandum in non-technical language, ignoring detail and drawing attention to the major implications of various alternatives and throwing the whole matter into proper perspective. A reasonably quick answer was often of more value than a more detailed report months later. Estimates of cost were, of course, of vital importance, and there was great scope for technical ingenuity in devising short-cut methods appropriate to particular problems which would give reasonably reliable estimates of order of magnitude, with, ideally, indications of the probable upper and lower limits of error. In that connexion there was need for research. In general, actuarial technique was leisurely; it did not yield quick answers kindly. Very often, because of some special phase in the history of a pension fund, either the age distribution or the duration of past pensionable service, or both, was so irregular that the data seemed to defy treatment with any real confidence by ordinary sampling methods. The circumstances of different pension funds varied so widely that the 'model office' technique was of limited value.

There was another particular application of actuarial technique the importance of which was becoming increasingly recognized, namely the need in almost any large organization for a central index of certain essential information covering each member of its staff. The precise details depended on the purpose for which summarized and scientifically-prepared statistics were likely to be required. At the least, the index would yield reliable age distributions and the material for the measurement of promotion rates, wastage, and sickness, the latter bearing especially on any occupational risks that might be involved. Punched cards were particularly appropriate in that connexion.

It was unnecessary to refer at length to the contribution the actuary could make to

investment problems, except again to remark that technical proficiency lost much of its value if it was not accompanied by the power of presentation. An example was the exercise of trying to explain briefly the true meaning of a redemption yield in language sufficiently clear to be intelligible to the uninitiated and yet accurate.

A device which actuaries used frequently, and which to them was so obvious that it was almost second nature, had in his own experience proved a powerful aid in dealing with many problems of computation outside the actuarial field. He referred to the habit of preparing columnar working-sheets, with columns logically developed from left to right across the page. A most striking example of that had arisen in preparing certain financial estimates required in connexion with the construction of a new railway extension involving a heavy capital cost. Parliamentary sanction had included the usual power to charge to capital account the interest payable during the period of construction on money borrowed to finance the new construction. The new works were to be brought into service progressively over a period of years, as the various sections were completed. Power to charge interest to capital in respect of expenditure on a particular section was to lapse when that section was brought into service. The programme of dates for bringing the various sections into service was available, supported by estimates of capital expenditure in six-monthly periods in respect of each section. The problem was to estimate the total ultimate charge to capital account for interest during construction, which, of course, was to be compounded during the period of construction. The arithmetic was complicated by two special features: the capital had been raised in instalments at different times and on different terms, and credit had to be allowed for interest on idle money held against future expenditure, that money having been invested in a variety of short-term securities carrying different rates of interest and maturing at different dates, matched broadly with the estimated dates of expenditure. It had not been easy to devise a suitable columnar working-sheet, and in its final form the sheet was of formidable dimensions. But by its complexity the problem had defeated all other attempts to solve it. With the working-sheet, the arithmetic was performed satisfactorily by relatively unskilled clerks. Calculations required from time to time to take account of variations between actual expenditure and estimates were reduced to a matter of routine.

Estimates of future population in the area to be served had played their part in the decision to construct the railway extension. There were various other fields of work for which population estimates were required, which were, indeed, fundamental to any intelligent provision for present and prospective social needs.

The statistical returns to be found in different departments of a local authority service were often of haphazard growth. The requirements of different departments were seldom, it seemed, articulated one with another, and he suspected that that was true in greater or less degree of all large organizations. One good way of discovering whether a periodical return was really required was to withhold it for a month or two and see what happened. Forms, returns and records, and the manipulation of the information recorded on them, were at the root of all large-scale endeavour. Few of the basic processes were at all difficult, but it was a feature of modern civilization that simple things done on a sufficiently large scale had a habit of becoming difficult. Paper work must be ruthlessly regimented if it was not to become a master. An example was the 'pay-as-you-earn' system of income tax deduction from salaries and wages. The calculations for a single taxpayer were simple and well-devised; but, when a large staff was employed, the aggregate of the simple calculations represented a material addition to the work and to the employer's costs, and the question of method was all-important. It was the same with all large-scale clerical work, and indeed with all questions of large-scale organization. Formerly the emphasis was on minimizing costs of performance; it had changed to economy of man-power, but the problem was the same. The actuary, with his habit of careful analysis and his flair for a practical approach, had a distinctive contribution to make to that class of work.

In connexion with the 'pay-as-you-earn' system, a weakness in the existing technique was that observance of the cumulative principle meant that the same calculations had to be performed week by week whether an employee proved to be liable to tax or not;

the higher the proportion of those not paying tax, the greater the burden of quite useless work, which could be avoided only by the employment of abnormally intelligent clerks or machines. An alternative method, giving the same results but capable of application in ordinary circumstances, would be of universal benefit.

Whether considering solved or unsolved problems, it was clear that, away from his more conventional work, the actuary had a distinct contribution to make to the evolution of the social pattern which was changing so rapidly. On the other side of the account, it was a refreshing and altogether beneficial experience for the actuary to mix and work with men whose training and experience were quite different from his own and to have to find his own level in a world where the tradition of respect for his profession was unknown.

As regarded consulting practice, there was scope in relation to the work required by the smaller organizations; but the great difficulty probably was to secure recognition of unfamiliar questions as fit matters for reference to an actuary by those who did not know the work which actuaries performed. With large organizations, the more usual way was for a whole-time actuary to be recruited as a specialist for specialist functions. In the course of time such a man would find his store of local knowledge increase and his opportunities of service multiply; his feet would be set on a path of fascinating exploration, and it was probable that nobody would be more surprised than the actuary himself at the varied applications that his craft proved capable of sustaining.

Mr F. J. C. Honey remarked that he knew little about local government; his excuse for taking part in the discussion was that he happened to be one of those actuaries who had strayed from the straight and narrow path which led through the insurance field. With reference to the author's suggestion of consultant service for the smaller local authorities, he personally thought that there were strict limitations involved; his impression was that with local authorities, as with many other organizations, the management just did not realize when they were faced with a problem requiring actuarial technique, and sometimes, indeed, did not realize the existence of a problem at all. Unless there was a full-time man who had grown up in an organization, and who realized its needs and applied his special technique to solving the problems that arose, it was improbable that there would be obtained anything like the full benefit that the services of an actuary could give in local government or in industrial or commercial undertakings. If a local authority was not of sufficient size to employ an actuary of its own, it was doubtful whether it was of sufficient size to perform many of its other functions satisfactorily. Probably what the author would really like would be a reform of local government; but perhaps that was going a little too far from the subject of the paper.

He felt that in industrial and commercial undertakings there was a very big and useful field for actuaries, but infiltration into that field would inevitably be slow. One of the biggest problems facing the industrialist was the large and growing proportion of non-productive work, and an industrialist would want to be quite certain that he was making a good investment before he appointed an actuary or any other specialist at a high salary. Possibly one of the most fruitful methods of infiltration would be for members of the Institute to venture outside the life office field before they had qualified. A man who had taken Part III of the Institute examinations, and who had a sound knowledge of statistics and an interest in economics, might well take an appointment—probably a statistical appointment—in a large organization; he would be able to do so at a salary commensurate with his age and with a feeling of certainty on the part of his employer that the salary paid to him would not be a waste of money. Such a man could then grow up in the organization, and could apply the technique which he had acquired to the particular problems of the organization. He was not suggesting, of course, that a man who left the insurance field having passed Part III should not continue with the examinations in order to qualify. It was essential that he should. It might be suggested that he would be handicapped in sitting for the later parts by having left the life office field, but personally he did not think that that was the case. He might, in some instances, find them a little more difficult, but he should know sufficient of life

office practice to be able to deal with examination questions in the later parts whic required such knowledge; on occasions he might even benefit, because he might answe the examination questions, not on the basis of what a life office did, but of what i ought to do!

He wished to refer to what was rather a controversial question, namely whethe actuarial training really did help a man in industry. One school of thought argued tha the Institute examinations were very difficult and highly selective, and that the perso who could survive them could survive anything; such a person would probably hol his own in the outside world, but there was nothing special in the actuarial trainin itself which would ensure success. The other school of thought argued that there wa in fact, matter of great value in the actuarial training, and that such a training was o value to a career in industry or commerce to a greater extent than the training require for most, if not all, other professions. He personally agreed with the second schoo He thought that there was infinite value in actuarial training, even if the studen subsequently undertook very little if any purely actuarial work. The student starte off with a good grounding in mathematics, which was very valuable indeed, but parte company with the pure mathematician when the latter entered the field of 'imaginary results. The training of the actuary taught him to apply scientific methods to practica problems, and from the available data—very often inadequate for a complete solution— to obtain the best practical result. Actuarial training gave an attitude of mind and method of approach for the application of which there was enormous scope in industry

He hoped that the infiltration into industry would gather momentum. He believe that those members of the Institute who took the plunge would find opportunities o service to the community and of benefit to themselves.

Mr D. B. Martin said that the author was associated with the colossus of th local government world, a local government body which was certainly the largest i Great Britain and very probably the largest in the world. A great deal of what th author had said was appropriate to that colossus, and even to the giants of local govern ment, the authorities of the Home Counties, Lancashire, the West Riding of Yorkshire Birmingham and a few of the larger county boroughs, but it was not very appropriat to the broad base of the local government pyramid, the small urban district and rura district council, the parish council and that mysterious body (of which he believed tha there were 4000 in the United Kingdom) the parish meeting. The introduction of a actuary into any of the smaller councils would come up against one big difficulty— that of finance. In the budget of the London County Council the author probabl represented something like the third decimal place of a 1*d.* rate; but if he were appointe to the staff of the council with which he personally was concerned he would represen no less than a 2*d.* rate. Even though conditions might be such that a mere 2*d.* rate wa regarded as of no account, there would ultimately come a time when ratepayers woul want things of that kind scrutinized.

It was true that the author had suggested that there was some scope for part-tim work, by which it was apparently intended to suggest that one actuary should shar himself among a number of local authorities. There a psychological difficulty arose; i was necessary to have something to do with one of those smaller councils to discove just how strong 'parish pump' politics still were, how extreme was the parochialism still existing. He quoted a concrete example from his own experience to the effec that—incredible though it might seem—a Medical Officer of Health who covered thre associated districts had not dared to take the risk of revealing to the council of one o them what was the current measles incidence in the area of the one next to it eve though that information would have materially assisted the deliberations of the firs council. The small local authorities were exceedingly jealous of their history, thei position and their privileges, and he did not think they would welcome the introductio of any more overriding officials; such officials would have to be forced upon them fro above, by statute or otherwise.

The author might reply that it would be quite possible for the actuary to be employe by the administrative county and thereby to advise the various authorities in tha

county. The author had probably had in mind the case of the L.C.C., with its strong and statutory relations with the various metropolitan boroughs; but with a typical administrative county there was the difficulty of geography. He quoted the case with which he was most familiar, that of the county of Cheshire, with an area from the Wirral at one extreme almost to the Peak at the other, and running down to the borders of Shropshire. That county covered a tremendous diversity of types and interests, and, while a certain amount of control from the centre was imposed on all the councils in that area, any extension of that control and any unsought advice from the centre was far from welcome. He was afraid that the 'County Actuary' would need to be a diplomat of no small order if he was to 'get his nose in' with the local councils concerned. What was more, an actuary accumulating statistics from the centre of a wide-spread administrative county would probably come up against the question of heterogeneity. It was doubtful whether statistics collected in mass would have any great meaning when the field covered many different social, industrial, and other conditions.

To make constructive comment on the paper, he suggested that it was not necessary for the actuary to limit himself to the official side of local government work; in fact, he would like to think that the actuary would not do so. There was a great deal to be done on the non-official side, in which the actuary could use his general figure sense and his ability to understand a problem quickly and reach a reasonable conclusion on it. What was more, local government service had something of considerable value to offer, certainly to the young actuary. It offered him abundant scope for any desire he might have to be of service to the community, and it gave him a chance to learn the ways of handling committees and (to put it at its lowest terms) of securing his own way in spite of opposition—the practice of which art should be of considerable value to his general development. He was not enthusiastic about the association of actuaries with local government on the official or money-making side, though he was about association on the purely service side.

Mr A. H. Shrewsbury commented on the definition or description of 'organization' given on p. 335. It seemed to him that 'organization' depended greatly on what was to be organized, and thus the definition might be either too wide or too narrow. The case, for instance, of such a simple matter as the filing of papers did not require what was referred to on p. 335 as breadth of vision; yet everyone knew large organizations the efficiency of which was greatly impaired by the speed with which they found—and lost—their papers. In organization it was important to have a clear conception of the ultimate object and to remember that generally there were available only imperfect human tools to work with. It was necessary, therefore, to have a certain amount of imagination as well as common sense, and some idea of people's characters. He disagreed strongly with the suggestion that an actuary necessarily had the qualities of an administrator. Most people knew solicitors whose opinion on a point of law was valued but whose offices were a shocking muddle, physicians to whom they would cheerfully entrust their lives but not the organizing of a hospital, architects whose artistic and engineering ability and knowledge of materials were most impressive but not their views on pounds, shillings and pence; and it was possible to recall a number of historical instances of successful generals who relied upon a good chief of staff. It was clear, therefore, that something in addition to even quite good professional ability was wanted.

He did not think that the first sentence on p. 341 was true. He knew of two instances to the contrary within his own experience, one as a patient and one as an onlooker. In those cases the physician had made no physical examination and no use of radiology or of pathological tests, but, by careful questioning, had arrived at a diagnosis which was subsequently found to be correct. Some of the argument on p. 341 was consequently a little obscure. On a minor point, it was difficult to see how fertility was an index of health. Admittedly there was a connexion, but was it an index? On p. 342 it was suggested, quite correctly, that health was very difficult to define. If that were so, and if various statistics were being collected on aspects of health, was not it necessary to have at least a working definition related to the particular object in view?

There were some interesting points on p. 340 with regard to the computation of the numbers emerging in future years for various purposes. An actuary could estimate—and it was useful to do so—the number of pints of milk wanted in various future years, but that would not ensure an efficient result. He quoted an instance within his knowledge which showed that it was necessary to allow for the fact that not all children could take milk and that some would refuse it during periods of sickness. Rigid rules were not always sensible; it needed somebody with organizing ability to avoid waste in matters of that kind.

He disagreed with the implied assumption running through the paper that the local authority ought to do all things itself. Presumably to a great extent it had to try, but was that necessary always? For instance, with reference to insurance, was not the best course to advise a local authority to go to people who were experienced in it? A commercial company or a mutual concern designed to deal with the particular needs of municipalities would have available an organization combining technical and administrative ability with a sufficient volume of business to give a good result, and in the great majority of instances the local authority would do better to go to such a company than to take action itself.

He was interested to see on p. 342 the exposure of a statistical fallacy and on p. 336 the reference to the useful work which an actuary could do to prevent overlapping and waste of effort by various departments of a big organization. Work of that kind any competent actuary should be able to do well; and then, if he had the rather indefinable qualities of an administrator, he could go on and do other things. It might, perhaps, be argued that he had more than an average chance of acquiring administrative ability because his training did at least cause him almost instinctively to look ahead.

Mr K. A. Usherwood said that, although the author had outlined directions in which there was undoubtedly scope for the useful employment of actuaries in local government, he had included examples where others besides actuaries could also be employed. A number of the examples cited were cases where the functions could equally well be performed by any person of adequate mathematical, statistical and practical outlook, whatever his qualifications. Actuaries must not persuade themselves that they had a copyright in certain forms of knowledge or certain methods of approach beyond the limits within which they did in fact possess such knowledge and methods of approach. There was, for example, no actuarial copyright in columnar work. A certain numerical problem had recently given him considerable trouble until a little quiet thought had led to a solution, not by actuarial methods, but by methods which he had learnt in the fourth form at school.

In the fields of industrial, commercial and municipal activity the actuary, however well he might be qualified, had very often much to learn before he could give of his best. Some actuaries had been astonished to find the depths of their own ignorance of the mechanics of industry during the war, and the process of completing their strictly actuarial education to a point where it became possible even to comprehend what was being talked about had sometimes been considerable.

Mr E. A. J. Heath regretted that Mr Shrewsbury had made an attack on the paper, because personally he had enjoyed reading it and had found some remarks in it which were extremely pleasant—particularly one to which Mr Shrewsbury had referred: 'Health is as difficult to define as truth.' He was not, however, certain that there was a statistical fallacy in the example given on p. 342, also referred to by Mr Shrewsbury. Because of a reduction of 2 mm. in mean height and 0·18 kg. in mean weight it was stated that there was a deterioration in physique, but, from a long study of medical reports, he would far sooner have a doctor's opinion as to whether a person was malnourished or slightly subnormal than rely on statistics. He felt that a doctor who was actually looking at a case could give a very much better opinion than an outsider who merely studied statistics. In statistics of public health there could be fallacies whatever precautions were taken. He knew of a person who had been in a sanatorium and who subsequently attended a local clinic, although, as he said, 'there is really no

need to do so—I have my own physician—; but I am doing well, and they like to have a few good cases on their books; it helps the average'.

The actuary did succeed outside the life assurance field, and personally he was convinced that his training helped him to take a very much broader view of outside problems than would be taken by the ordinary man, whatever his education; but when the author said that 'In recent years both Government and industry have discovered that... there are qualities possessed by the actuary that adapt him peculiarly for the higher levels of executive responsibility', he thought it should be pointed out that there was no indication that the discovery had been made by Government and industry. The actuarial profession had discovered it; it would, however, be a very long time at the current rate of progress before it could really be said that the actuary stood out in Government service or in industry. He agreed that much could be done by actuaries serving on local councils, as Mr Martin had suggested, by quiet 'infiltration', and by persuading the local councils that they ought to have actuarial science applied to some of their problems.

Sir William Elderton, K.B.E., suggested that the justification for an actuary in an insurance office was that by his presence and his work he managed to do better for the people who were insured and for the shareholders, if any, than would be accomplished without him. If an actuary was to be employed in business or in local government work, the only real ultimate justification should be that money would thereby be saved. If the employment of an actuary by any local government authority would save money from the rates, by better management and better arrangements, then the actuary had won. He would have to save at least as much as his salary and the overhead expenses which his employment entailed; if he could not do that, they might just as well go on without him.

Mr H. P. Clay said that some of the ideas which had been put forward in the discussion seemed to him a little strange, such as the emphasis on the fact that mere competency in dealing with purely actuarial problems would not lead to success in local government work. Of course it would not; but he questioned whether it would anywhere else. One of the things from which actuaries would most rebound with horror would be the idea that by staying in the life assurance field the ladder would be ascended and a senior post attained merely by the passage of time and actuarial ability. It was, of course, only the people with additional, more human, qualities who would succeed, whether inside the insurance field or outside it.

He had obtained the impression from the discussion that members felt that local government work was going to appeal, and to offer a successful livelihood, only to those among the younger members of the profession who were leaders in mathematical work and outstanding in every other quality, so that all such people would be taken away into local government service and the insurance world be entirely denuded. He did not think that that was so. Equally, he questioned the suggestion made by Mr Honey that actuaries taking up local government work might do so after passing Part III of the examinations. He believed that the opinion of an actuary who entered in a junior capacity after passing Part III would receive less attention twenty years later than if he had entered after he was a Fellow or, better still, after he had gone through that period of resettlement which should follow the completion of the actuarial examinations and the obtaining of the Fellowship.

It was not a question of what a young actuary could do, of whether he could save his salary, or more than his salary, and whether he could prove it, but of whether he was going to have a chance to prove it. In his opinion, the senior members of the profession were much more likely to be able, in their spare time, to persuade the larger local authorities that actuaries were useful than were some of the younger men by putting their smaller weight to that end earlier in their careers.

Mr H. E. Melville said that the author had properly emphasized the fact that actuaries had certain qualifications which ought to enable them to turn their hand to

many jobs outside the ordinary work in which they were engaged, and had indicated local government service as one of the spheres where they ought to be useful. It was obvious that the London County Council must have use for whole-time actuaries, but personally he doubted whether there was room for whole-time actuaries, or indeed for very much actuarial service at all, in the smaller local government authorities. It was true that there must be a sound statistical background for all good administration, but in his own limited experience of local government work, as a Councillor, he had formed the impression that the officials were quite capable of producing suitable statistics and interpreting them as occasion arose. It was only rarely that there was need for an actuary to be called in.

The author had referred to various types of problem which ought to be investigated, and had instanced in education the need for estimating the accommodation required for school children in the future. That was particularly important in his own part of the world, because they were expecting several new towns to be developed, and it was impossible to estimate at all closely what the population would be or what the population and age distribution of school children would be; but he found that the education department were quite alive to that point, and quite prepared to make the estimates, which were likely to be just as accurate as any that he, as a trained actuary, would be able to make in prevailing conditions.

The author had also referred to statistics of the nutrition of school children. They were useful for the education authority primarily, he thought, because they enabled the schools to get particulars of any children who were obviously undernourished and see that they got a good midday meal. Beyond that, he doubted whether the statistics served any useful purpose; at any rate they were of no use to the county, so far as he had been able to discover. The classification depended almost entirely on the personal views of the medical officer making the examination of the child.

The author had referred to the desirability of standardizing rates from year to year. That was getting rather away from actuarial matters, but personally he disagreed with the theory that rates should be stabilized. He believed that if new burdens were thrown on local authorities and new costs were incurred they should be reflected in the rates at once, so that the ratepayers knew for what they were having to pay. Reference was also made in the paper to the importance of watching the valuations as between one district and another. That again was an important point, but he did not think that it was one on which the actuary would be of use.

With reference to the table on p. 339 showing the suggested lay-out of one of the new towns, he noticed that 57% of the area was to be allotted for houses presumably of the working-class type and only 3% for 'better-class houses to secure "mixed" development'. Even an actuary could judge better than that how much better-class housing was needed to get a balanced community; he did not himself believe that 3% was adequate.

His own impression of local government was that by the standards to which actuaries were accustomed it was inefficient and expensive. He thought that that was due to two reasons. First, the set-up was wrong. There was no profit and loss account; there was no means of testing any department, or the machine as a whole, to see whether it had done a good year's work or not; and there were far too many sectionalized and more or less watertight compartments. There was no general manager responsible for looking after the organization as a whole. He spoke with quite limited experience, but he believed that that made for waste of effort, duplication and expense. The other reason was that the majority of the Councillors were not themselves business people. They were not capable of criticizing financial matters or administrative matters. Many of them were very enthusiastic about getting their own particular job done—education or public health or whatever it might be in which they were interested—and the officials were equally keen on getting their work done, work which, broadly speaking, had been allotted to them by Parliament; none of them was very much concerned to ask what it was all costing.

He did not believe that the actuary in the employment of a local government authority could do very much. He did not think that local government service offered the actuary

either the financial inducements or the opportunities of advancement which the younger men would seek. But he cordially supported the suggestion made by Mr Martin and Mr Heath that actuaries could be of very real service to the community as members of local councils. They at least knew something about finance, they had a critical faculty, and if they did no more than ask the right questions and see that they got the appropriate information he believed that they could do a very great deal to help in local administration and to secure the economies in expenditure that were so important.

Mr W. H. Clough, in closing the discussion, remarked that, like Mr Melville, he had been associated for some time with local government matters. That was one of the avenues by which it was open to every actuary to enter local government. During the discussion the difficulties of becoming a local government officer had, he thought, been adequately expressed. One such difficulty, of course, was the age of recruitment. It was the custom of local government authorities, as of the Government, to recruit at a young age, and that somewhat barred the entry of technical people at the age when actuaries would be partly or wholly qualified. Consequently it would be difficult for an actuary to acquire a paid position; and yet, if there was any validity in the idea of the Appointments Board and of widening the scope of the profession, it was obvious that if actuaries could be of use to industry they could also be of use to local government, which, after all, was a very sectionalized form of industry.

Quite apart from the service of individual local authorities, there was possibly a case to be made for some central employment of actuaries. There were Associations of County Boroughs and of County Councils which acted as a liaison between the various boroughs and counties, and he was certain that useful research work could be done, as had been done in the Employers' Confederation, by actuaries in that service.

The question had been raised of utilizing the services of consulting actuaries, if it was not possible to employ full-time actuaries, in local government. He felt that in many instances much more use could be made of the consultants who were already advising local authorities in connexion with their superannuation funds if they were employed in other directions, or even if they were only consulted more frequently as to the policy of investment applied to those funds. Many officers of local authorities believed that the only avenue for investment was internal investment in the authority's own money, but that became very difficult when a local authority could borrow from the Government at 2½%, which was therefore the rate that would have to be used for internal investment. It then behoved the chief financial officer to try to find other fields, and there an actuary in a consultative capacity could be very useful to the authority.

It was true to say, he thought, that a number of the larger county borough and county councils could afford to have an actuary on their staff.

Mr Shrewsbury and others had made the point that there was no reason to suppose that the actuary had that 'something' which other people had not, but surely actuaries had never claimed that, any more than they had ever claimed that they were the only people who could enter the statistical world or that they could enter it on a better basis than anybody else. What they had said was that certain actuaries had administrative ability in addition to their academic qualification and the preparation for that qualification might have helped them to acquire it. That should appeal to local authorities, who apparently had the belief that solicitors, or some of them at least, had in themselves administrative qualities which allowed them to become town clerks and take the place of that general manager whose absence Mr Melville had rightly deplored. There was no doubt that many actuaries had the ability to act in an administrative capacity, and if that was true in life assurance it could be true in other walks of life as well.

New problems were arising in local government and there was need for statistical investigation. The problem of the satellite towns, for which a large amount of statistical research was desirable, had been mentioned; there was also the problem of the nationalization of various trading undertakings of the different authorities, and of the compensation to be paid by the Government.

He wished to add his plea to that of others that, rough though the path might be, there was a value in taking that part in the life of the community which was represented

by being a member of a local authority. His own local authority had recently, even on such a matter as a change in the basis of collection of the rate, discovered that it was possible to save something of the order of a 3*d.* rate by a change in the method of collection, and that in a borough where a 1*d.* rate represented £6000. It was an instance of where wastage took place. Wastage was bound to take place, because, as Mr Melville had said, every chief officer of a local authority was interested mainly in the development of the work of his particular committee and its policy. There was no co-ordinating influence other than that of the town clerk and the members of the council, and therefore the better the calibre of the latter the more could be achieved, not merely in savings in rates, which was not the only criterion, but in the improvement of amenities and in raising the general conditions of life.

The President (Mr A. H. Rowell), in proposing a vote of thanks to the author, said that the Institute welcomed a paper from one of its members who was a practical exponent of the extension of the scope of the profession—an expressive if not unduly elegant phrase of which so much had been heard in the past quarter of a century. He himself hesitated to claim any first-hand knowledge of local government, except that of a prompt and punctilious ratepayer, and for that reason he wished to deal with the subject on rather wider lines than those of the paper itself.

The moment that he read the author's opening sentence, with its reference to a problem of analysis and synthesis, he felt on familiar ground. He was reminded of the references made on many occasions to the essential qualities of the ideal actuary, and of the fairly wide agreement that foremost amongst those essential qualities there should be an ability to analyse, accompanied by equally valuable powers of synthesis. It was tempting to argue that because those were the qualities that the actuary required, and because actuarial training was so carefully devised to meet them, therefore they were the qualities with which the actuary by his training was endowed, and further that, as they were the component parts of the problem of administration or organization, therefore the actuary was automatically fitted for success in such fields. Personally, he had never succeeded in deciding whether actuarial training could claim any marked superiority of virtue in that respect over any other equally rigorous course of intellectual discipline. A great deal undoubtedly depended on the personal qualities of the individual.

On p. 343 the author had asked the question which lay at the root of the problem of extension of scope, namely what should be done to bring the men and the opportunities together, and had suggested that as matters stood there were required for success an adventurous actuary on the one hand and an enterprising employer on the other. Personally, he felt that the actuary would always need to have a spirit of adventure, but he wondered whether the Institute ought not to be able to do something to lessen the need of enterprise on the part of the employer. The effort should be in the direction of rendering out of date the author's statement that actuarial qualifications were not understood. The author's suggestion of building up a consultant practice did not, in his personal opinion, adequately meet the case; the real hope in that matter was that the actuary might often establish himself as invaluable in a full-time capacity in cases where he was not at first sight recognized as necessary.

Mr B. Benjamin, in reply, said that he wished to dissociate himself from any intention of preaching to local authorities as to what they should do. He merely wished to suggest certain things which they might do, and which in his opinion would improve their service. Sir William Elderton's point that an actuary would have to save his salary was very pertinent, but it was not only a question of saving money—it might be a question going to the root of local government service, with the accent on 'service', namely the improvement of the service which was given to the people who subscribed to the particular authority.

He was sorry to learn that there was still an authority in this country on the budget of which he would represent a 2*d.* rate. Mr Honey's reason for suggesting the reform of local government was urgent.

He was sorry that the illustration on p. 342 had been elevated to the proportions of a great statistical fallacy. He had had no intention of claiming very much for it except as a little illustration of the sort of misconception that tended to persist in the absence of criticism; but he would disagree with the view that the doctor's classification of malnutrition was always better than some form of index. In the circumstances mentioned the medical officers could not easily prevent their conception of normality from being influenced by the average condition of children passing before them at a particular point of time. A condition regarded as normal at one time might be regarded as abnormal at another.

Mr Benjamin has subsequently written as follows:

I am grateful to both Mr Spratling and Mr Clough for remarks which were so close to my own point of view and for their apt choice of illustrations, which form a valuable extension to my paper.

Both Mr Spratling and Mr Honey stressed the important difficulty, in relation to consultant practice, that actuarial problems might not be recognized as such. This is an educational problem and might be tackled by the co-ordinating bodies to which Mr Clough referred.

Mr Honey suggested excursion outside the normal field on passing Part III. I think we might go further and encourage junior entrants to the local government service to take the Institute examinations.

I doubt whether Mr Heath was really serious in his suggestion that medical statistics were 'faked' by the selection of good cases. Such a manipulation of figures, like wishful thinking, is a human failing but, among the many health-workers with whom I have come into contact, it is rare.

Mr Melville's remarks appear to be contradictory. In the first place he claimed that in local government there was already adequate statistical treatment of problems and that the need for actuarial assistance rarely arose, but he went on to say that local government was inefficient and expensive.