Report on occupation analysis : the study of the aptitudes and attainments necessary for success in different kinds of employment.

INSTITUTE REPORT NO. I

NATIONAL INSTITUTE
of
INDUSTRIAL PSYCHOLOGY

FOUNDED IN 1921 FOR THE APPLICATION OF PSYCHOLOGY
:: AND PHYSIOLOGY TO INDUSTRY AND COMMERCE ::

OCCUPATION ANALYSIS

THE STUDY OF APTITUDES AND ATTAINMENTS NECESSARY FOR SUCCESS IN DIFFERENT KINDS OF EMPLOYMENT

THE FIRST OF A SERIES OF SPECIAL REPORTS DESCRIBING AN EXPERIMENT IN VOCATIONAL GUIDANCE CARRIED OUT IN LONDON BY A GRANT FROM THE CARNEGIE UNITED KINGDOM TRUST

PRICE 2/-

PUBLISHED AT THE OFFICES OF THE INSTITUTE, 329 HIGH HOLBORN, LONDON, W.C.1.

National Institute of Industrial Psychology.

President—The Right Hon. THE EARL OF BALFOUR, K.G., O.M., F.R.S.

Director—C. S. MYERS, C.B.E., M.D., Sc.D., F.R.S.

Telephone—Holborn 2599. *Address*—329, High Holborn, London, W.C.1.

The Institute is a scientific association for studying the human factors which enter into industry and commerce, and for applying the results in practice. On behalf of firms, it conducts investigations into the effects of movement study, rest pauses, lighting, humidity, ventilation, seating, methods of payment, advertising, etc., and into the value of a more systematic selection and training of workers.

In its own laboratories it offers vocational guidance to individuals, based on mental and physical tests. It also offers training courses in the application of psychological tests.

Members and Associates receive copies of all the Institute's publications, including the JOURNAL; and are entitled to preliminary consultation on any of the subjects falling within the scope of the Institute. Lectures and demonstrations are given during the winter session.

REPORT

ON

OCCUPATION ANALYSIS

OR THE STUDY OF THE APTITUDES AND ATTAINMENTS
NECESSARY FOR SUCCESS IN DIFFERENT
KINDS OF EMPLOYMENT.

VOCATIONAL ADVISORY COMMITTEE.

The Institute desires to acknowledge the valuable help afforded to its Vocational Section throughout this Experiment by a special Committee which acted in a consultative capacity and consisted of the following members:—

P. B. Ballard, M.A., D.Litt., District Inspector, London County Council Education Department.
Cyril Burt, M.A., D.Sc., Professor of Education, University of London.
E. Salter Davies, M.A., Director of Education for the County of Kent.
Miss F. H. Durham, C.B.E., Chief Woman Inspector, Ministry of Labour.
G. H. Gater, C.M.G., D.S.O., M.A., Education Officer of the London County Council.
Miss E. S. Haldane, C.H., LL.D., J.P., Trustee of the Carnegie United Kingdom Trust.
J. H. Hallam, M.A., Inspector of Education, West Riding County Council.
Major E. Harvey, M.B.E., Secretary to the London Juvenile Advisory Council.
W. L. Hichens, Chairman of Cammell Laird & Co., Ltd.
H. T. Holmes, O.B.E., M.A., Divisional Inspector of Technical Schools, Board of Education.
Mrs. S. S. Isaacs, M.A.
D. T. John, Ministry of Labour.
Sir John Mann, K.B.E., Mann, Judd, Gordon & Co., Chartered Accountants.
Andrew Messer, M.B., C.M., B.Sc., J.P.
Lt.-Col. J. M. Mitchell, O.B.E., M.C., M.A., Secretary to the Carnegie United Kingdom Trust.
T. P. Nunn, M.A., D.Sc., Professor of Education, University of London.
Miss H. G. Nussey, Principal Assistant Organiser of Children's Care Work, London County Council, Education Department.
Rt. Hon. Sir Horace Plunkett, K.C.V.O., F.R.S., D.C.L., LL.D., Trustee of the Carnegie United Kingdom Trust.
F. H. Spencer, LL.B., D.Sc., Chief Inspector, London County Council Education Department.
M. Tagg, B.Sc., Acton and Chiswick Polytechnic.
Dr. C. J. Thomas, Principal Assistant Medical Officer, London County Council.
A. E. Twentyman, late of the Board of Education.
A. F. Watts, M.A., Assistant Inspector, Board of Education.
H. J. Welch, Chairman, National Institute of Industrial Psychology.
D. R. Wilson, M.A., Secretary to the Industrial Fatigue Research Board.
Sir Robert Witt, C.B.E., M.A., F.S.A., Vice-Chairman of the National Institute of Industrial Psychology.

Note.—The members of this Committee acted in a personal capacity and were not officially representing their departments, etc.

PREFACE.

This report on Occupation Analysis is the first of a series of studies now engaging the attention of the Vocational Section of the Institute. Two reports of the progress of the Institute's Vocational Guidance Experiment have been published separately, but it may be remarked that the formulation of the advice given in that experiment would have been impossible without enquiries of the kind described in these pages.

It is fitting, also, to mention that this report is the outcome of the team work of the staff of the Vocational Section. During the course of an investigation such as the present one, there is much discussion and interchange of views, and the final expression of any idea is the product of many minds. Although the form and contents of this report are largely the work of Mr. F. M. Earle, who is in charge of the Vocational Section, the contributions of Misses Spielman, Roberts and Stott, of Mr. Macrae and particularly of Miss Blackett, who began a systematic analysis of occupations for the purpose of the experiment, deserve acknowledgement. The Institute is also greatly indebted to Mr. D. R. Wilson, Secretary to the Industrial Fatigue Research Board, and to Mr. D. T. John, of the Ministry of Labour, for invaluable assistance in determining the most suitable terminology for a report of this kind.

C. S. MYERS.

December, 1926. *Director.*

CONTENTS.

1.—INTRODUCTION.

MEANING OF OCCUPATION ANALYSIS.

The study of the aptitudes and attainments necessary for success in different kinds of employment is an essential part of the Vocational adviser's work. Various names have been applied to these studies. Job Analysis has been used, but some writers prefer to limit the meaning of job to that of a specific task within the occupation. In such a case " Occupational Description " is employed to express a " bird's eye view of the occupation in terms of its duties, working conditions " and " of the capacities and interests required in its performance."[1] Others, again, have introduced the term " Vocational Analysis," drawing a distinction between " Vocations," " Occupations " and " Jobs."[2]

In this country the term " occupation " is generally used in a wide sense, and it is advisable not to give this term too specialised a meaning. We propose therefore to speak of " occupation analysis " in a general sense so as to include every kind of enquiry that the vocational adviser's study of employment entails. Occupations, however, are usually divisible into subsidiary departments and processes, and it is often necessary to refer to these by name. The word " department " is easily understood as a unit of factory or business organisation, while the word " process " readily conveys the idea of a series of special tasks which together make up the occupation as a whole.

In this report, then, occupation analysis (or, as some would say, " Vocational Analysis "[3]) means the analytic study of occupations in order to discover the human capacities which are essential to success.

But not all studies of occupations are similarly motivated. It is clear that the selection of material and the form in which the results of the analysis are to be expressed will differ with its aim and purpose. It will be useful, therefore, briefly to review some of these purposes.

PURPOSES SERVED BY OCCUPATION ANALYSIS.

Occupation Analysis may be employed for several purposes. These relate mainly to : (*a*) Vocational Guidance, (*b*) Vocational Training, (*c*) Vocational Selection and (*d*) Industrial Psychology generally.

(*a*) VOCATIONAL GUIDANCE includes all efforts at suitably advising and placing in employment a person, whether child or adult ; some of these efforts are voluntary and unorganised, *e.g.*, the unofficial services given by teachers in schools ; others are the results of State support, *e.g.*, the Juvenile Employment Advisory Councils, etc.

Advice may be given before the child leaves school, or afterwards ; courses of training, full-time or part-time, may follow ; work may be found in co-operation with employers.

[1] For example, Scott and Clothier, *Personnel Management* pp. 125-6.

[2] cf. Kitson, *Psychology of Vocational Adjustment*. He regards an occupation as a department or branch of a Vocation.

[3] cf. Kitson *op cit*. He defines Vocational Analysis as a process of dissecting a vocation and describing its component elements.

In all cases information of some kind about the work is needed by the child, the parent, the teacher, or the 'vocational adviser.'[4] As each approaches the problem from a different standpoint each requires information specially selected and specially expressed.

(*b*) VOCATIONAL TRAINING may be interpreted widely or narrowly, from the point of view of the educational administrator and teacher or from that of the employer. The one is concerned with providing a variety of technical courses in special schools and classes ; the other with the special training of employees for each branch or department of his factory. At one time apprenticeship was the chief method of training for skilled occupations, theory and practice being studied together. The modern technical school has a wider function to fulfil, but it tends rather to emphasise the theoretical aspects of the occupation, even when due regard is paid to the importance of practical skill. On the other hand, the attitude of the workshop is undoubtedly a narrower one, the main consideration being the practical mastery of each process. The technique required for this mastery differs considerably and this accounts for the varying importance attached by employers to methods of training in the workshop and before entry.

Here again success in training waits upon a satisfactory occupation analysis, and the requirements of the different agencies for training in the matter of information about the occupations are as varied as they well can be. The technical school courses are based upon the necessary technical knowledge, analysis being directed towards the method of performance ; the works manager arranges his training programme upon the lay-out of his factory and upon the working methods of his most skilful workpeople. It is difficult to suggest an occupation analysis which would serve both purposes.

(*c*) VOCATIONAL SELECTION, which aims at securing the best man for the vacant position, resembles Vocational Guidance in its general relation to occupation analysis, but differs in regard to detail. The employer, when engaging new employees or re-distributing old ones, must consider their suitability for the work in hand. He cannot dispense with some analysis of the requirements of each process. Recently the importance of psychological, as well as physical, factors has received wide recognition ; consequently the analysis of the process is required in greater detail and with special reference to particular aspects of importance, such as the qualities of speed and accuracy in workmanship, or the nature of the strain imposed upon the worker.

(*d*) INDUSTRIAL PSYCHOLOGY includes various aspects such as ' movement study,' fatigue studies (rest pauses, etc.), factory organisation, and so forth. In all these cases an occupation analysis, sometimes of a minute kind, sometimes of a general kind, is needed. Only so can any illustration of psychological principles be demonstrated.

From these examples it is clear that the needs of Vocational Guidance in the matter of occupation analysis are in several respects different from those of either Vocational Training or Vocational Selection. In the former case the range of enquiry has no limit, the need for detail is very great, and the detail requires its own special formulation and interpretation. Hence the help which cognate studies in allied fields can give to the work

[4] In England we have no recognised name for such a person. ' Organiser ' and ' employment officer ' are at present in use. In America ' Counselor ' is now in common use to describe a person whose special duties are those of giving advice upon choice of occupation and upon the arrangement of an appropriate curriculum of studies.

of Vocational Guidance is not so great as might be supposed. The Vocational Adviser, for example, may desire to know the degree of skill required to do a piece of work, its requirements in physical effort, or in endurance, or in intelligence, while the available studies are only expressed in terms of processes of manufacture or material handled—such as from sheet-iron to tinplate, from tinplate to tin box. It is necessary, therefore, that the results of occupation analysis, if they are to be useful in Vocational Guidance, should be specially compiled ; quite frequently a fresh method of attack, a fresh analysis, and a fresh form of expression must be employed.

II.—OCCUPATION ANALYSIS IN VOCATIONAL GUIDANCE.

KINDS OF VOCATIONAL INFORMATION REQUIRED.

The need for Vocational information has not always been adequately appreciated ; yet, in all countries in which Vocational Guidance is receiving public attention, the general development during the last twenty years has been remarkably similar.[1]

In most cases the first needs were met by getting together information concerning conditions of apprenticeship or entry to the occupation, wages, hours of labour, prospects of promotion and so forth. This was a useful procedure, especially in the days when legislation against harsh conditions of juvenile employment had not yet secured its full effects. Even now, when many of the harmful features of juvenile employment have disappeared, this information is important. It may often be the deciding factor when the immediate situation has to be directly compared with future prospects. Handbooks consisting of details of this kind were compiled. In some instances eminent men in various occupations were asked to describe their work and its attractions, financial and otherwise, for the benefit of those who were contemplating such a career ; this practice still continues.

But at quite an early stage it was realised that the demands made by the work upon the worker's physical strength and health, or upon his mental capacities, or upon such temperamental qualities as conscientiousness, good temper, etc., also require consideration.[2] Reports of the requirements of an occupation therefore began to include observations of this kind :—

> ' A lad should be physically tough and strong, though not necessarily of heavy build, and should have a sure eye and quick judgment. He should show a decided inclination for the trade.'[3]

Similarly estimates of the requirements of the occupation in mental capacity or in knowledge—as shown by such phrases as ' a good education ' or ' a standard VII ' school grade—were sometimes included.

The next step, in some countries at least, was to improve the quality of these descriptions. The application of psychology to industrial problems and the development of better methods of selecting employees showed how defective are the general statements about an occupation, made by persons who are unskilled in analysis, psychological or

[1] See the *International Labour Review*—Articles on Vocational Guidance in Germany (Vol. XI, No. 4), France (Vol. XIII, No. 3), America (Vol. XIII, No. 1).

[2] In England the establishment of the Juvenile Employment Exchanges helped considerably in this.

[3] *Handbook on London Trades for the use of Advisory Committees for Juvenile Employment in Greater London.* 1915.

otherwise. Consequently descriptions of a more elaborate and penetrating character, using the accumulating knowledge of the psychological aspects of industrial processes, are now being demanded.

In England, owing to the dislocation caused by the war and to the fact that only recently has it been possible to allocate definite responsibility in these matters,[3] development has not been rapid. Occupational studies are comprehensive in scope but not very helpful in detail. Although some officers and organisers are aware of these deficiencies, descriptions continue to be expressed in general terms of questionable value ; for example,

'A skilled smith commands a good wage but the work is heavy and hot.'[4]

In few instances can it be truly said that the descriptions are adequate, even when they are written ostensibly for juveniles. This is not difficult to understand when we consider the range of information which is required.

The chief kinds of information thus required may be classified as follows :—

1. General Information.

   The occupation as a whole ; the process as a part of it.
   Nature of the work to be done, material handled, and so forth.
   Sources of supply of raw materials ; destination of finished products.
   Size and importance of the industry ; seasonal variations.
   General conditions of entry ; nature of previous general training desirable etc.

(2) Special Information.

   (i) *Technical*—the various divisions of the occupation, the machinery and methods used in these divisions, the special purpose of different processes.
   Training necessary and where given ; antecedent to or concurrent with workshop training.

   (ii) *Physical and Hygienic*—conditions of the work as affecting health, requirements of each occupation in strength, endurance, etc., outdoor or indoor work, sitting, standing, exposure, eyestrain, etc.

   (ii) *Psychological*—conditions of the work bearing upon the worker's success and happiness, including those which are likely to affect him adversely. The degree of skill or intelligence, the qualities of temperament and character required for success.

   (iv) *Social*—effect of the employment upon the status, mode of life, etc., of the worker. Companionship, recreation, etc., in connection with the workshop and factory organisation as a whole.

   (v) *Economic*—wages, hours, prospects, methods of entry, labour turnover proportion of low paid work, etc.

The collection of this information in its many aspects is a task for specialists, and the co-operation must be secured of those who are expert in industrial technology, in

[3] Education Act, 1921. §107. Rather less than half of the local Authorities undertake this responsibility. In other places the Ministry of Labour is responsible.

[4] O. B. King, *Employment and Welfare of Juveniles*, 1925.

psychology, in social problems, and in knowledge of factories and workpeople. In the meantime it is desirable to collect and systematise information from all suitable sources. The most useful standpoint from which to examine it seems to be that of the vocational psychologist who realises that the psychological aspects are not only important in themselves but also inseparably connected with the social, economic and technical aspects of the occupation.

DIFFERENT USES OF VOCATIONAL INFORMATION.

An American questionnaire[1] sent out in December, 1924, brought replies suggesting that ' occupation studies ' were useful in five different directions, viz. :—

(1) COURSES OF STUDY and TALKS on occupations in public schools.

(ii) INTERVIEWS for guidance and placement.

(iii) VISITS TO INDUSTRIES by teachers and counselors.

(iv) PROFESSIONAL STUDY by teachers, counselors and supervisors.

(v) UNIVERSITY COURSES for prospective teachers and counselors.

It will be seen that two of these are concerned with equipping the vocational adviser for his special work, one of them with the practical work of interviewing, and two of them with providing information for juveniles.

Clearly all these purposes cannot be adequately served by one single ' occupational study ' unless it is extremely comprehensive and detailed. Even then it will need to be largely edited or rewritten for the information of juveniles.

Moreover American writers are sometimes urged to consider particularly the ' philosophic ' content of these studies. What this implies is indicated by the following schedule showing the systematic form of report suggested for ' occupational studies ' in Vocational Guidance.[1] It will be seen that social and economic aspects occupy a prominent place. The report is to be arranged thus :—

(1) NATURE, IMPORTANCE AND HISTORY OF THE BUSINESS.
Definition, description and characteristics of product or services, etc.
Classification ; allied occupations, source and preparation of materials.
History ; beginnings, changes and progress.
Importance ; number engaged in the work, etc.
Contributions to social welfare ; necessity, use, value, social and educational influence.

(2) OPPORTUNITIES FOR JUNIOR EMPLOYMENT AND INSTRUCTION.
Survey of workrooms, location, description, pictures, visits.
Departments and occupational organisation of the work, etc.
Junior jobs[2] and nature of qualifications, 14—15 years, 16—18 years, etc.
Training giving in workshops ; courses in local schools, etc.
Lines of promotion.

[1] M. R. Lane, " Content, Volume, and Use of Occupational Studies," *Voc. Guid. Mag.* April 1926.
[2] ' Jobs ' in the sense of sub-divisions of the occupation. *cf.* notes on p. 1.

(3) Working Conditions.

Hours of labour, wages, incomes, regularity.
Health and problems of workrooms.
Economic and social welfare of employees, etc.
Future of business or industry.
Advantages and disadvantages.

(4) Job Analysis.

Skilled jobs described in outline as to
Tasks, materials, equipment.
Output quantity and quality standards.
Knowledge and skill required for success.
Qualifications for successful workers.
Strains and hazards of the job.

In addition there is a foreword, table of contents and bibliography.

Such a report has distinct advantages, but it cannot meet the needs of all persons equally. At least three important groups of people have to be considered ; they are :—

(*a*) Children and adolescents of age twelve and upwards (as material for private reading).

(*b*) Parents and teachers (for purposes of class teaching).

(*c*) Employment officers and vocational advisers (including teachers acting in this capacity).

In the first group emphasis needs to be placed upon the social and economic aspects, although some reference to the general conditions of the trade, the courses of training desirable, and the physical requirements of the work, is also necessary. Several local Education Authorities have prepared special pamphlets of this kind which are very suitable for the purpose.[1] Some of them are useful for the second group of persons ; they provide teachers with material for a class discussion. But the more fully the teacher wishes to instruct his pupils, the more complete technically does he desire these descriptions to be ; while parents who understand something of their children's special abilities (or disabilities) desire to differentiate between occupations on other grounds than wages and prospects. The following description is therefore not sufficient for their purposes :—

' The work is entirely in iron and steel, and in some branches when a steam hammer is used work is very heavy. Boys are put to light work at first, as a great part of the skill is of necessity in the handling of large pieces of red hot metal, yet boys entering this department of the engineering trade must be strongly built. The making of ornamental ironwork calls for artistic ability and an aptitude for working from drawings.' [2]

This account of Smithing, taken from an account of the Engineering trade as a whole, is significant of a considerable advance in our attitude towards occupational studies. Here is an attempt to indicate some of the more important qualities required in the boy,

[1] *Cf.* pamphlets prepared by the Kent, Leicester and Birmingham Education Committees.

[2] Extract from remarks on *Smithing* in a pamphlet prepared by the Leicester Education Committee. N.B.—To facilitate comparisons the examples quoted on this and other pages are all taken from descriptions of Smithing.

even though phrases such as ' artistic ability,' ' quick judgment '[1] (which, in relation to smithing, may be a matter of spatial perception rather than of human motives and interests), are not yet precisely defined. In detail perhaps there is not much difference between these and the earlier handbooks,[2] but there is a distinct advance in the relative values attaching to information of different kinds. Psychological aspects are receiving more and more attention.

Detailed psychological analyses, however, belong properly to the information prepared for employment officers and vocational advisers. But for them also the information compiled under *all* headings, technical, psychological, economic, etc., should be as full as possible. There was a time when a general description of the trade conditions seemed quite sufficient. It was assumed that ability—or, rather, adapt-ability—was a general possession, and that an ' average ' boy was good enough for anything ; in fact, boys and girls were regarded as very much alike from an employment point of view—as ' hands ' in other words. Now, however, the importance of the differences between one person and another, vocationally as well as socially, is recognised and we cannot continue to be satisfied with a *general* statement of what an occupation requires. We must now consider such details of employment, as relate to differences between individuals which we can, if we wish, directly measure. Modern methods of Vocational Selection rest solely on this principle ; and Vocational Guidance also provides scope for its useful application, especially in relation to the needs of the vocational adviser.

SPECIAL NEEDS OF VOCATIONAL ADVISERS.

It is impossible for every vocational adviser to visit personally all the factories and workshops in his area to study occupations in detail, though it is always advisable that he should study the general conditions of work. Consequently he needs descriptions which will enable him to carry out a satisfactory analysis without prolonged visits. At the same time it does not seem possible to obtain occupational studies which are everywhere applicable unless we limit considerably the scope of our enquiries. It is well known that the same occupations vary greatly in detail from one locality to another. Every vocational adviser (or group of advisers) finds it necessary to compile for his own purposes summaries of the requirements of the occupations to be found in his district. Yet if every adviser were to begin *ab initio*, he might reasonably quail at the magnitude of the task. He is therefore compelled to consider how far *general* occupational studies are sufficient for his purpose.

A form of report suggested for an occupational study has *already* been given (page 5), but as one of its principal aims appears to be the provision of information for the use of teachers, the needs of Vocational Advisers are not fully met. The latter require much more attention to be given to the studies of processes, the details of which ought to be largely psychological ; the tendency of those who give lectures on ' vocations ' must always be to dwell more upon the interesting details upon which philosophic discussion can be based[3] Now the vocational adviser's chief need is a statement of the *common*

[1] *Cf.* extract p. 3.
[2] *Cf.* Board of Trade *Handbooks on London Trades,* 1915.
[3] *Cf.* §§ 1, 2, 3 of the report quoted on p. 5.

elements in all occupations. Inasmuch as this is the result of comparison, descriptions should be such that comparisons can easily be made. This is best done by making the psychological aspects the basis of analysis.

It follows that the systematic observation of occupations, should be carried on by the help of psychological methods, and that the results should be expressed as simply as possible in psychological terms and categories. This is not to say that psychological elements are missing from the schedule mentioned above—on the contrary, they occur in nearly every section ; it is rather to change the point of view and method of approach. Only by careful attention to the purely psychological aspects of the problem can the needs of the vocational adviser (as distinct from the teacher and the child) be adequately met; especially since he is now using psychological methods to gain information concerning those he is called upon to advise.

III.—GENERAL PROCEDURE IN OCCUPATION ANALYSIS.

FORM OF REPORT.

Although an elaborate ' occupational study ' may be the ultimate aim, it is advisable in the early stages to avoid unimportant detail and to report only the most significant features of the occupation. It is usually helpful to summarise the information (for details see page 4) on two separate forms :—

Form A—covering the occupation as a whole.

Form B—covering each separate process.

These forms are arranged as follows :—

FORM A.

GENERAL OCCUPATIONAL DESCRIPTION.

Occupation :

1. GENERAL INFORMATION : (cf. §1, page 4).

II. SPECIAL FEATURES OF THE OCCUPATION : (cf. §2, page 4).

Method of entry and prospects : (*cf.* §2 v, page 4).

Qualifications required :

(i) attainments : (*cf.* §2, i, page 4).

(ii) physical : (*cf.* §2, ii, page 4).

(iii) aptitudes : (*cf.* §2, iii, page 4).

III. NOTES : (*cf.* §2 iv page 4).

FORM B.

Occupation : **Branch or Department:**

Process :

Process Description.

(*a*) GENERAL.

(*b*) PSYCHOLOGICAL.

Intelligence or General Ability :

Special Abilities (kind degree desirable) :

Manual Skill (including bodily activities) :

Temperament (qualities required) :

Experience (general or special training) :

(*c*) PHYSICAL.

(*d*) METHOD OF ENTRY AND PROSPECTS.

NOTES.

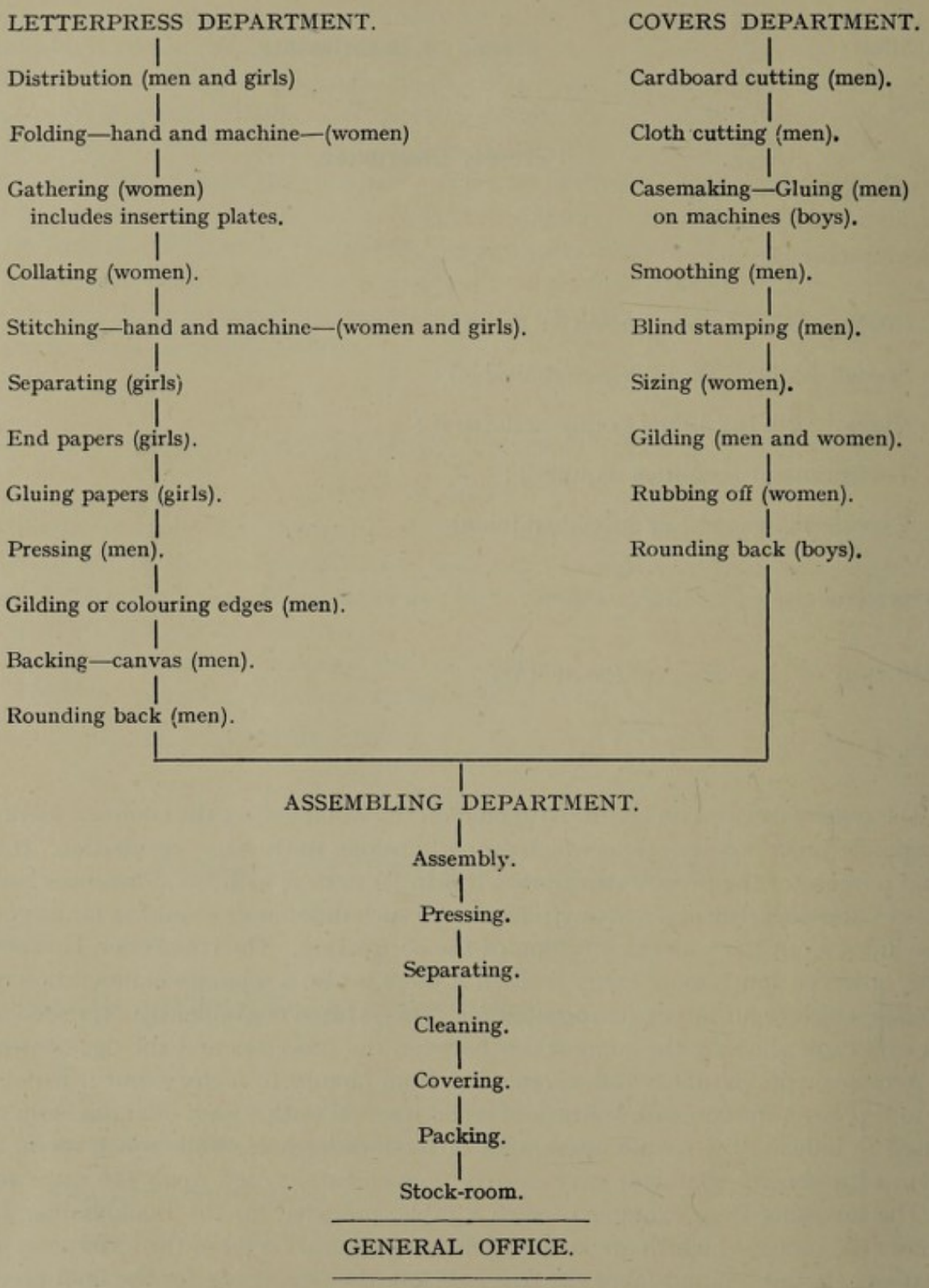
The *general* description (Form A) should on the whole reflect the common features of the separate process descriptions which properly belong to the same occupation. It is the special purpose of the process description (Form B) to deal with the differences between processes and departments, and any reference to such differences should as far as possible be excluded from the wider description of the occupation. The connection between the two is, however, much more easily realised if there is also a separate enumeration of the processes which occur in any one occupation. This is often conveniently expressed in the form of a table showing the connections between the processes and the departments.

Arrangements naturally differ somewhat from factory to factory, but it is not difficult to represent the common features of an occupation in this way. Marginal notes may be used to indicate the nature and extent of these differences, while much useful information of a general character may also be conveniently noted upon the same form.

The following is an example of such a table, prepared for the Bookbinding Trade. It shows the processes which are necessary in the preparation (*a*) of the letterpress before the covers are put on, and (*b*) of the covers before they are ready for the final processes of assembly.

It is perhaps not altogether typical of the trade as a whole, for it does not include account-book binding and similar work, but it illustrates how the various processes may be ' schematically ' arranged.

BOOKBINDING.



NOTE : Some of these headings include several subsidiary processes which may sometimes be considered as separate ' operations.' Subdivision into ' processes ' only needs to be carried to a point which serves practical purposes. Further differences would receive attention in the detailed studies cf. analysis of laundry work pp. 19-31.

STUDY OF EACH SEPARATE PROCESS.

It is now clear that the systematic study of an occupation implies :—

(i) General review of the occupation and its departments.
(ii) Enumeration of processes in the separate departments (in tabular form).
(iii) General description of each process and its conditions (Form B.*a*).
(iv) Special description of each process in psychological terms (Form B.*b*) and completion of each separate process study.
(v) Final[1] statement of the requirements of the occupation in the light of the detailed studies of the processes (Form A).

There is no need to discuss these stages in detail. The most important for our present purpose (the needs of the vocational adviser) are the general description of each process and the special psychological analysis of its requirements.

DESCRIPTION OF THE PROCESS IN GENERAL TERMS.

A description of the process in general terms is necessary because a summarised description in psychological terms may not carry sufficient detail to enable the reader to picture it. The aim of any description in general terms should be to convey as clearly and as briefly as possible the essential features of the requirements of the work. Any experienced person can then interpret the psychological descriptions with complete understanding.

The following examples illustrate several types of such description :—

OCCUPATION : Bookbinding. DEPARTMENT : Bookbinding—Letterpress.
PROCESS : Folding.

The folder sits before a low table on which rests a pile of book sheets each of which has to be folded into a section or signature. She holds in her right hand an ivory book-folding tool of dimensions 9 in. by 1½ in. by ½ in. As she places the previously completed section on a loose pile on her left, with her right hand she sweeps the tool over the next broadsheet to flatten it, ending the movement in the top right hand corner. The left hand now steadies the sheet while the right hand lifts the top corner and brings it straight towards the worker, placing it finally on the bottom right hand corner of the sheet, where the left hand fixates and registers the two angles. This registering must be extremely accurate. (With some workers it is done instantaneously, with others a good deal of fluttering of the sheet occurs before the fold is accurate. Frequently the work is folded to ' print,' *i.e.*, so that the print may be straight on the page.) The tool is now swept along the folded edge from left to right, and sometimes the left hand simultaneously turns the sheet so that the folded edge now runs at 45 degrees to the worker. The right hand moves up again to the right hand corner, brings it over as before, the left hand again fixates and registers the two angles, whereupon the right hand creases the fold with the tool. The process is repeated until the section is completed.

OCCUPATION : Boot and Shoe Making. DEPARTMENT : Uppers.
PROCESS : Clicking.

The clicker has to cut the shape necessary for the upper of the shoe. He uses a very keen knife held between the palm and the last three fingers of the hand and steadied by the pressure of the thumb and forefinger on the leather. He cuts round the edge of a cardboard pattern edged with brass. This he does at high speed—a very skilled operation not easily acquired. Skill is also involved in placing the patterns in such manner as to avoid blemishes and cuts in the leather.

[1] But of course, these statements can never be final. As knowledge of the special requirements of processes increases, so must the general statements of occupational requirements be modified in the light of such changes.

OCCUPATION : Instrument Making. DEPARTMENT : Electric Indicator Making.

PROCESS : Sand Papering.

The completed frames are sandpapered by pressing them against large rotating discs. Strength is required. A small boy of 14 finds it necessary to use his whole weight and a considerable leg thrust to secure sufficient pressure, *i.e.*, arm pressure is not enough. The finer sandpapering which is required to finish off the surface is much lighter work.

These three descriptions differ considerably in form, although all of them are fairly adequate when the circumstances controlling the work are considered. The most suitable details in any description are often decided by conditions peculiar to the occupation. It is not easy to bring all these variable circumstances under a few main types, yet the following are obviously some of the more important ones :—

(*a*) The type of process in which the position of the worker and the movements to be made are very important, success depending partly upon the ' lay-out ' of the work, partly upon the ' method ' of working, but *largely* upon the manual (or bodily) skill of the worker[1]. In this case a detailed description of the worker's movements is necessary.

(*b*) The type of process in which lay-out and method are still important but in which there is less scope for variation, the apparatus used or the material to be worked being such as to restrict variability of method. Here skill consists partly in neuro-muscular adjustment to the circumstances of the work, but may also involve factors such as general intelligence. In this case the description should indicate the limitations imposed by the apparatus and materials.

(*c*) The type of process in which even greater restrictions are imposed by the apparatus and circumstances of the work, *e.g.*, in machine minding processes. For processes of this type less detailed descriptions may suffice, although even here a superficial account may miss some important feature.

In general the aim should be to give sufficient detail to enable the summarised results of a psychological analysis to be fully interpreted.

DESCRIPTION OF EACH PROCESS IN PSYCHOLOGICAL TERMS.

Success in any branch of human activity depends largely upon the possession of the requisite aptitudes (or qualities) and attainments (knowledge and skill). The latter are partly the products of training and experience, but they are also considerably influenced by the presence or absence of inborn qualities which, for convenience, we may call ' natural aptitudes.' The determination of the nature and amount of the natural aptitudes possessed by any person is, though difficult, vocationally important.

The general question of what are the most important qualities from the point of view of Vocational Guidance is considered more fully in another connection.[2] For the

[1] *Cf.* discussion of *skill* on p. 15 Physical strength is, of course, required in some cases.

[2] In the Institute's principal report on its Vocational Guidance Experiment, which is now being prepared.

present purpose it is sufficient to assert that the most important qualities include :—

1. Intelligence.
2. Special aptitudes such as mathematical, linguistic, artistic, musical, etc.
3. Manual and bodily skill.
4. Temperamental qualities which affect a person's attitude towards people and things.

The influence of all these upon the nature and extent of training which it is desirable to give must also be considered.

DEFINITION OF PSYCHOLOGICAL TERMS EMPLOYED.

It is perhaps necessary to explain briefly the sense in which certain terms are used in an occupation analysis of this kind.

Intelligence.

Intelligence is a general mental ability which is usually regarded as including adaptability to a new situation, foresight or planning ahead, and the power of self-criticism. It is displayed not only in the intellectual processes, so called, such as occur in reading, calculation, and other scholastic pursuits, but also in the skilful manipulation of tools and materials. Methods of measuring intelligence, therefore, vary with the range of problems—practical or scholastic—in which intelligence is likely to be shown, or required.

In occupation analysis a general description of the process itself will often disclose the nature of the problem to be solved, and from this a rough estimate of the degree of intelligence required for the work may be framed (due regard being paid to the other qualities needed for success). The degree of intelligence required may be determined with greater accuracy from the scores obtained by representative groups of workers in suitable tests devised for the purpose. Investigations in Vocational Selection frequently include examinations of this kind, and the results are useful. On the other hand, the estimates of superintendents, foremen, etc., are liable to be based upon variable standards and may therefore require adjustment by an expert observer.

Special Aptitudes.

The term ' special aptitude ' is employed in contrast to general ability or intelligence. In the use of language to produce poetic effect, the power of making rapid computations, musical expression, mechanical constructiveness, persons differ greatly. These differences undoubtedly have some connection with general mental power, but the connection is not a very close one. Consequently it is usual to say that a person possesses special ability in this direction or that. The following are generally regarded as special abilities in this sense, and there are doubtless others :—

Musical ability, linguistic ability (for foreign languages), literary ability, mechanical ability, social ability, mathematical ability, practical ability and artistic ability.

Manual and Bodily Skill.

By *skill* we usually mean *precision* in the control of any movement or *speed* in the repetition of the movement, or both in combination.

By *manual skill* we mean skill in the use of fingers, wrists, elbow, and shoulder (usually of the preferred arm and hand, sometimes of both hands together) either separately or in combination.

By *bodily skill* we mean skill in which the whole body is the agent. It often includes operations of separate limbs (arm, hand, leg or foot) but need not do so.

In the analysis of many occupations manual skill is the most important element, but the contributions of the other limbs and the bodily structure generally must also be taken into account.

Attention.

This is an important element in many skilled activities, but the incidence of conscious control or ' focussed attention ' differs greatly from process to process. Sometimes in movements of high precision and often in movements at high speed, conscious control is at a minimum. In other words, the movements are largely automatic, and attention in such cases may be taken up in other directions, such as maintaining external conditions favourable to the continuance of the movement. Generally, however, a useful distinction may be drawn between the attention required in machine-minding processes on the one hand and in inspecting processes on the other.

In machine minding attention may be ' distributed ' (or divided) ; a number of objects are claiming attention and each must in turn pass into the range of clearest perception and out again with varying rapidity. It is largely a visual process, although there may be cues from other senses ; and, inasmuch as the objects can be rapidly brought into the field of direct vision, oscillation of attention from one to another is comparatively easy.

On the other hand, in inspecting for faults (when the worker may set his own time), or in sorting (when the time may be set by the machine), attention is differently employed. Each object is momentarily scrutinised with intense concentration, comparison with the standard is immediately made, and interest in the object ends as abruptly as it begins. The ability to carry on this process without mistakes is not necessarily connected with the ability to attend to many objects ' simultaneously.'

Temperament.

This term denotes that part of the innate constitution of the mind which is different in different men.[1] It usually finds expression in the emotions which accompany specific acts and may influence the immediate relations between one person and another, or between a person and his work. A person is, for example, temperamentally nervous, or peevish, or suspicious, or lethargic.

Character.

This term is used in reference to the general poise or attitude (partly inborn, partly acquired) which consistently influences the behaviour of a person and makes for the permanence of relations with others. Character implies organised systems of self-control, as *e.g.* fortitude, patience, loyalty, steadfastness, etc.

[1] *Cf.* Shand, *Foundations of Character.*

The various qualities under consideration may be recorded in two ways, viz. :—

(i) As *types* such as the differences in attention—' concentrated ' or ' distributed.'

(ii) In *amounts*. The degree of skill required, or the extent to which the quality in question is desirable may be expressed quantitatively in several ways. When standard tests are available, as in the case of intelligence, a numerical quantity may be used. In other cases terms previously defined such as excellent, good, average, fair, and poor are useful, but it is advisable to compare the meaning given to these terms with some standard rating scale.[1] A graphic rating scale may be helpful in some cases.

It ought to be possible to assess the degree of ability required with considerable accuracy. There will naturally be some variations from factory to factory ; for instance, the way in which duties are combined or separated may alter the requirements of an occupation.

But generally the study of the occupation should lead to a clear statement, quantitative whenever possible, of its requirements in respect of :—

(i) The physical endowment which is necessary.
(ii) The general and special abilities needed.
(iii) The accuracy and precision of movement required. (The classification of movements is discussed more fully in the next paragraph.)
(iv) The speed of movement required ; distinguishing processes in which speed does not matter from those in which it does.
(v) Attention.
(vi) Temperamental qualities.
(vii) What training is required and in what form.
(viii) Effects of practice and training.

FURTHER DISCUSSION OF MANUAL AND BODILY SKILL.

(*a*) Types of Skill required.

The observations, suggested in the last paragraph, upon the accuracy and precision of movement in any skilled operation can only take place when those movements are suitably classified. The following types are suggested in connection with the analysis of most forms of manual skill.[2]—

(i) Skill in processes which mainly involve sensitivity of finger tips. The instances in which this occurs alone are few, but in combination with other activities they are numerous. Such are needlework of various kinds, the making of small fancy articles, and many factory operations which involve delicate work, *e.g.*, the threading of electric lamp filaments.

[1] *Cf.* Scott and Clothier, *Personal Management.* Chap. XIII.

[2] The various tests used to measure dexterity of hand and fingers employ movements which are closely parallel to many of these types of skill. There is experimental evidence for asserting that children differ in their abilities in these several types of skill, and it appears very probable that these differences are vocationally important. *Cf.* Appendix.

(ii) Skill in movements which involve fine control of flexion and extension of the fingers. Since much of the control depends also upon tactual cues, these movements are frequently accompanied by Type (i). Examples :—Picking up small objects and all tool manipulations in which the tool is held in the fingers and becomes an extension of the fingers, such as writing, crocheting, knitting, use of forceps in watch assembly work and so on.

(iii) Skill in ' turning ' movements of the wrist, *i.e.*, pronation and supernation, *e.g.*, in using a screwdriver. In one sense this is a forearm movement, for the hand and fingers do not move independently during the movement of the bones of the forearm. In turning a door knob, for example, the knob is grasped (hand position taken up) before the turning begins.

(iv) Skill in ' flapping ' or ' hinging ' movements of the wrist, *i.e.*, flexion and extension, *e.g.*, in telegraphic signalling with a morse key, paint and varnish work, etc. This movement is not common except in combination with ' whole arm ' and finger movements as in typewriting, piano playing, etc.

(v) Skill in ' side to side ' wrist movements, *i.e.*, adduction and abduction. It seldom occurs alone but is often found in combination with a whole-arm movement or with the other wrist movements, *e.g.*, in clicking (boots), cutting out (shirts and collars), drawing and sign writing.

(vi) Skill in arm movements of precision. These include aiming and placing movements in which visual control is important, but are mostly the tool manipulating processes in which the tool is an extension of the forearm, *e.g.*, in soldering, in large scale writing and drawing.

(*b*) A Simple Method of Recording Movements.

To determine which of the above types of skill are most important in any process or operation, it is necessary to analyse the movements in some detail. This is done roughly for purposes of the general description of the work (*cf.* page 11), but comparison is facilitated if the movements can be expressed in terms which eliminate the non-essentials, such as the material handled, etc. The following system of notation has proved useful for the purpose of recording the basic movements in a given process.

S	is the general symbol for a shoulder movement.[1]
Sa	is a shoulder movement with straight arm.
Sb	is a shoulder movement with bent arm but fixed elbow.
Se	is a shoulder movement with bent arm but free elbow.
E	is the general symbol for a forearm movement located at the elbow. This is a limited one but may occur in two planes according to position of shoulder. Thus :
Ev	is a movement in a vertical plane.

[1] Note : To simplify the notation the movements have been located at the joints, but without reference to the mechanics of the movement. Thus in the shoulder movement no distinction is made between movement of humerus and scapula.

Eh — is a movement in a horizontal plane.
(v and h being used to indicate the plane in which the movement occurs).

W — is the general symbol for a wrist movement.

Wr — is the turning or rotating movement of the wrist, *i.e.*, pronation and supernation.

Wu — is the ' hinging ' movement of the wrist, *i.e.*, flexion and extension.

Ws — is the ' side to side ' wrist movement, *i.e.*, abduction and adduction.

f — is the general symbol for a finger movement.

t — is the symbol for a thumb movement.

f^1, f^2, f^3, f^4, signifies that the first, second, third or fourth fingers, respectively, participate in the movement. These symbols combined with that for the thumb may be used to describe various movements of the thumb and fingers together.

The chief types of finger movements are :—

(1) flexion and extension independently.
(2) finger and thumb brought together with pressure.
(3) finger and thumb brought together with rolling movement.

These may be shown by subscript numbers thus t_1, f^1_1, etc.,

t_1 being a flexion and extension of the thumb.
f^1_1 being a flexion and extension of the forefinger.
and t_3 f^2_3 is a twisting or rolling movement of thumb and second finger.
R and L indicate which arm is involved in the movement.

EXAMPLES OF USE.

(1) SHOULDER MOVEMENTS.

Sav — is a movement of the arm at full stretch in a vertical plane, as *e.g.* in one of the movements in Swedish drill.

Savf — is the same movement combined with finger movements but no wrist action. (The finger movement may be further described by additional symbols—see below $SavWrt_2f^2_2$).

Sah — is a movement of the arm at full stretch in a horizontal plane as *e.g.* in Swedish drill.

Sahf — is the same movement with finger action but no wrist.

SavWr — is a movement as in drawing on a vertical surface with arm outstretched (fingers occupied in holding the chalk or brush).

$SavWrt_2f^2_2$ — the same movement as just described with the addition of a middle finger and thumb movement of contact with pressure, *e.g.*, turning a small screw by wrist action at arm's length, the finger and thumb being used to hold the screw head.

SahWr — is the same as SavWr except that it is made horizontally instead of vertically.

$SahWrt_3f_3^1$ is a movement as just described but with addition of a thumb and forefinger movement of rolling (as in picking up beads at arm's length and placing them in a receptacle).

and so on.

Similar combinations of Sb and Se are used.

(2) Elbow Movements.

EvWu is an up and down movement of forearm combined with an up and down wrist movement but no finger movement (*e.g.*, a movement of clenched fist in which knuckles lightly touch a desk).

$EvWuf_1^1$ (or $EvWuf_1^2$, etc.) same movements plus finger movements as in playing a piano, typing, picking up objects quickly, etc.—different combinations of finger movements being separately indicated.

EhWu is a movement in a horizontal plane with a wrist hinging movement, but no finger action—practically only a drill exercise.

$EhWut_2f_2^{2,3,4}$ is a similar movement but with fingers and thumb as in grasping an object, *e.g.*, gathering an object on a table by a sweeping movement parallel to the table. (Note that this movement would hardly ever occur without a shoulder movement, in which case it would be $SehWut^2f_2^{2,3,4}$).

and so on.

(3) Wrist Movements.

$Wrt_2f_2^2$ is a pinching plus wrist turning movement as in pulling string from a box when the thumb and fingers constantly take fresh grip.

$Wrt_3f_3^2$ is a natural turning movement for a large screw when the finger twist (middle finger) can be helped by a twist of the wrist and *vice versa*, also in thread twisting (first finger) as in weaving.

and so on.

(*c*) Accuracy and Speed of Movement.

The above notation is useful in describing a movement, but it does not indicate the degree of skill which is necessary. The greatest skill is usually regarded as that in which the highest accuracy and precision of movement is shown, and this is often irrespective of speed, as, *e.g.*, in working in precious metals, in the fine arts, etc. Frequently, however, there is also an aim to secure the highest possible speed of movement consistent with accuracy. Occupations differ greatly in these respects, yet it is important to know which factor is of most importance in relation to the occupation as a whole. Some occupations for instance, may require a high speed of working for a short time followed by a period of rest or slow working ; others again require that the speed of working shall be maintained over as long a period of time as possible.

Accuracy of movement is usually assessed by reference to the *results* of the activity. For example, we speak of accuracy in making stitches of equal size, in cutting to a given line, and so on. It is to be noted, however, that accuracy in result may depend upon the way in which the contributing movements are carried out and combined. There is generally a ' best way ' which will give the best results, though it may not always be the same way for all workers. In estimating the minimum accuracy requisite for a satisfactory

performance of the work some attention must be given to these various aspects. The movement can usually be recorded.

(i) In kind or type—in symbols or words.
(ii) As rhythmic or not.
(iii) As requiring a degree of precision estimated by reference to a graded scale.
(iv) As requiring a rate of speed similarly graded.

In this connection (speed) it is also useful to note whether the rate of working is within the worker's control or not. In machine work there is a rate set by the machine, which the worker must be able to maintain. The rate may often be less than the worker's capacity when fully trained. In other cases the rate of working is set by the worker and is affected by many different influences. Whenever possible the *minimum* requirements for satisfactory work, and the usual achievement of average and superior workers respectively should be estimated. From information such as this an estimate can then be framed as to the possibility of a worker who is handicapped (physically or otherwise) being able to achieve a reasonable measure of success.

IV.—SAMPLE OF OCCUPATION ANALYSIS.

TABLE OF PROCESSES. LAUNDRY WORK.

Collecting	(men and boys).
↓	
Receiving office	Marking and pricing (women and girls).
↓	
Sorting	(women and girls).
↓	
Washing	Washing (*a*) by machine (men). (*b*) by hand (women). Wringing and drying (hydro-extractor) (men).
↓	
Calendering	(*a*) Preparing (girls). (*b*) Catchers and feeders (women and girls). (*c*) Takers-off and folders (women and girls).
↓	
Ironing	(*a*) Preparing (women and girls). (*b*) Machine (women and girls). (*c*) Hand (women and girls). (Examining).
↓	
Packing	Checking, parcelling (women and girls).
↓	
Delivery	(men and boys).

NOTES (1) 'Preparing' is difficult to classify, as it is used in different senses.
(2) In the detailed accounts which follow the work done by men and boys is not described.
(3) These descriptions of laundry work have been compiled from various sources and, therefore, may not wholly agree with the actual practice in any particular laundry.

GENERAL DESCRIPTION OF THE OCCUPATION (FORM A).

NAME OF OCCUPATION : Laundry Work.

(1) GENERAL INFORMATION.

Most laundry work is now carried on in large buildings with extensive use of machinery, hand labour being used only in certain special processes. It is mainly a women's trade, though men are employed as engineers and stokers, vanmen and vanboys, and wash-house men, in the proportions of 1 to 10. Girls under 17 form only a small proportion of the women and girls employed. Married women who are willing to work long hours during two or three days in a week are numerous. The work is not subject to extreme seasonal variation, and has become more evenly distributed throughout the week than it used to be.

(2) SPECIAL FEATURES.

ENTRY. *Boys* are taken on as vanboys and may be promoted to other work in the laundry, though men are often recruited from other trades.

Girls usually begin as taker-off at the back of the calender machine, and pass from there to other departments.

PROSPECTS. At 18 (or earlier) the girl is given an opportunity to learn hand ironing under a skilled worker. It takes a girl from one to three months to reach proficiency. Some laundries have regular training schools. Prospects of promotion are fair for the more skilled classes of worker, including fine ironers and machinists, from whom the forewomen are recruited.

Checkers and packers (requiring workers of higher intelligence and attainments than other branches) are also frequently appointed to branch receiving offices. Calendar hands do not often gain promotion.

RATES OF WAGES (to be filled in according to the districts).

QUALIFICATIONS REQUIRED.

Physical. Constant standing occurs and although the heavy work is done by men, girls should be strong. Steam and heat are trying.

Attainments. The receiving office, the packing and marking departments require girls of better school attainments than the other departments.

Aptitudes. Intelligence and accuracy are needed in sorting and packing, while different types of manual dexterity are needed in the various branches (*cf.* separate processes)

NOTES.

Hours of work are long, although regulated by the Laundry Act to cover different systems of engagement. A medical certificate of fitness is required for young girls.

DESCRIPTION OF DIFFERENT PROCESSES (FORM B).

(A separate form is used for each process).

OCCUPATION : Laundry Work. DEPARTMENT : Receiving.

PROCESS : Receiving.

PROCESS DESCRIPTION.

(*a*) GENERAL.

The hampers and parcels are opened and the customer's lists of articles are checked. The articles are then marked with a private mark for identification and prices to be charged for them are entered up in the customer's book. Damaged goods are ' notated ' by marking the injury in a special way.

(*b*) PSYCHOLOGICAL.

Intelligence. C+[1]

Special. Ability to calculate and write well.
Memory for prices and customers' special orders. B.
Attention to detail. B. Rate of working. B.

Manual Skill. Accuracy, D. Speed, C.

Temperament. No marked dislike for handling soiled linen.
Acceptance of responsibility and trust.
Careful and conscientious.

Experience. Standard V or higher.

(*c*) PHYSICAL.

Lightest kind of laundry work.

(*d*) METHOD OF ENTRY AND PROSPECTS.

Prospect of promotion to branch receiving is good.

NOTES.

This work is frequently combined with that of packing (*q.v.*). In other cases the marking and sorting processes may be carried on together.

[1] In this, and the process descriptions which follow, the letters A.B, C, D, E are used according to the following scale :—

A	B	C	D	E
Very High	Good	Average	Below Average	Very Low

Thus C+ signifies a rather better than average degree of the quality or aptitude under consideration.

OCCUPATION : Laundry Work. DEPARTMENT : Sorting.

PROCESS : Sorting.

PROCESS DESCRIPTION.

(*a*) GENERAL.

When the lists have been checked and the articles priced, the latter are sorted into wooden bins according to the treatment they are to receive. The sorters stand in a central position and distribute the articles into the proper bins.

(*b*) PSYCHOLOGICAL.

Intelligence.	C—
Special.	Speed in identification and classification of articles.
Manual Skill.	Accuracy, D. Speed, C.
Temperament	No marked dislike of handling soiled linen.
Experience.	—

(*c*) PHYSICAL.

Sorting is not very heavy work, but sorters often go to other branches of the work during the week.

(*d*) METHOD OF ENTRY AND PROSPECTS.

See pages 20, 21.

NOTES.

OCCUPATION : Laundry Work. DEPARTMENT : Washing.

PROCESS : Washing and Wringing (Hand).

PROCESS DESCRIPTION.

(*a*) GENERAL

Hand washing (for delicate goods, silks, flannels, and coloured articles) is done by women.

(*b*) PSYCHOLOGICAL.

Intelligence. D + or C—.

Special.

Manual Skill. Lightness of touch, C.

Temperament. Steady, easy going, withstanding monotony.

Care and conscientiousness.

Experience. —

(*c*) PHYSICAL.

Resistance to fatigue—standing.
Effects of prolonged immersion of hands in water.

(*d*) METHOD OF ENTRY AND PROSPECTS.

See page 20.

NOTES.

Bulk of the washing and rinsing is usually done in machines worked by men.
Wringing is also done in hydro-extractors (centrifugal principle) by them.

OCCUPATION : Laundry Work. DEPARTMENT : Calendering.

PROCESS : Preparer or Shaker out.

PROCESS DESCRIPTION.

(*a*) GENERAL

After washing and drying the goods are separated ; table linen, sheets and other flat work are sent to the calendering department, when they are put through calendering machines while they are still damp.

The preparers work in pairs and shake out and fold the flat articles for the feeders. Care must be taken that the corners and edges are flat.

(*b*) PSYCHOLOGICAL.

Intelligence. D.

Special. —

Manual Skill. C.

Temperament. As for other jobs in the calendering department.

Experience. —

(*c*) PHYSICAL.

As for other processes in the calendering department. Strength and endurance are necessary.

(*d*) METHOD OF ENTRY AND PROSPECTS.

See pages 20, 25, 26.

NOTES.

The preparers are usually transferable to other work.

OCCUPATION : Laundry Work. DEPARTMENT : Calendering.

PROCESS : Calender Hand—Feeder.

PROCESS DESCRIPTION.

(*a*) GENERAL.

The calendering machine consists of rollers working in heated beds so that drying and ironing occurs in one operation. Sometimes a junior operator or catcher lifts the article from a truck, shakes it out, holds it up by two corners for the feeder to take from her. The feeder then places it in the machine and prevents creases. In other cases, for large articles, the calender hands work in pairs.

(*b*) PSYCHOLOGICAL.

Intelligence. D.

Special. —

Manual Skill. Chief hand and arm movement is $t_2 f_{\frac{1}{2}}^{1, 2, 3}$ Se, R. and L. (touch control).*
Also elbow movement similar to that of press work (*q.v.*).
Accuracy of large movement, C. Speed, C+

Temperament. Calm, equable ; no objections to monotonous work.

Experience.

(*c*) PHYSICAL.

Good physique—long hours standing in steamy atmosphere. Body twisting movements continuous.

(*d*) METHOD OF ENTRY AND PROSPECTS.

Prospects of promotion and pay poor, but work is steady. No piecework or bonus.

NOTES.

The work of the ' catcher ' is rendered unnecessary when all the articles have passed through the hands of the ' preparer ' (*q.v.*). Also, in the calendering department, girls frequently exchange duties, especially when working in pairs.

* *Cf.* system of notation pp. 16-18.

OCCUPATION : Laundry Work DEPARTMENT : Calendering.

PROCESS : Taker off.

PROCESS DESCRIPTION.

(*a*) GENERAL.

The taker off receives the work at the back of the calender machine and arranges it conveniently in loose folds either for sending through the machine a second time or else ready for the folder.

(*b*) PSYCHOLOGICAL.

Intelligence.	D.
Special.	—
Manual Skill.	Large arm movements. Accuracy, D. Speed, C.
Temperament.	Care—ability to withstand monotony.
Experience.	—

(*c*) PHYSICAL

A less robust type than feeder is often employed as taker-off.

(*d*) METHOD OF ENTRY AND PROSPECTS.

New workers generally begin on this process and vacancies in other departments are usually filled by girls from this department.

OCCUPATION : Laundry Work. DEPARTMENT : Calendering.

PROCESS : Folder.

PROCESS DESCRIPTION.

(*a*) GENERAL.

The folders (with the assistance of the taker-off) fold the article to suitable dimensions to fit the baskets.

(*b*) PSYCHOLOGICAL.

Intelligence. D.

Special. Attention to blemishes.
Ability to judge sizes, for folding to fit baskets.

Manual Skill. Large arm movements. Accuracy C. Speed B.
Rhythmic body movements.

Temperament. Care. Ability to resist monotony.

Experience. —

(*c*) PHYSICAL.

See other processes in the calendering department.

(*d*) METHOD OF ENTRY AND PROSPECTS.

See pages 20, 25, 26.

NOTES.

In some laundries taking off and folding is done by the same workers..

OCCUPATION : Laundry Work. DEPARTMENT : Ironing.

PROCESS : Preparer.

PROCESS DESCRIPTION.

(*a*) GENERAL.

Body linen, shirts, collars, etc., from the wash houses are dried in large drying rooms and then pass to the preparers who starch, damp and prepare them for the hand ironers and finishing machines.

(*b*) PSYCHOLOGICAL.

Intelligence. D.

Special.

Manual Skill. Accuracy C+. Speed C.

Temperament. As for other departments.

Experience. —

(*c*) PHYSICAL.

Not heavy work.

(*d*) METHOD OF ENTRY AND PROSPECTS.

See pages 20, 30.

NOTES.

The work may be done either by a woman (in which case the requirements are of the simplest) or by a young girl who later wishes to qualify as a hand-ironer (*q.v.*). Generally the hand-ironers prepare their own material.

OCCUPATION : Laundry Work. DEPARTMENT : Ironing

PROCESS : Machine Ironing.

PROCESS DESCRIPTION.

(*a*) GENERAL.

Different machines are employed for different kinds of work, *e.g.*, body ironing (press work), goffering, neckbanding, collar finishing. The worker sets her own pace and works very much on her own. Of these, collar work is the most important.

(*b*) PSYCHOLOGICAL.

Intelligence. D +.

Special. —

Manual Skill. Movement $Ehf^{1\,2\,3\,4}Ws$ varies with the machine.
Collar Press, $t_2f_2^1\,^2Eh.R.L.$
Accuracy, D or E. Speed, C+.

Temperament. Cautious. Able to work independently, *i.e.*, suits a girl who finds difficulty in getting on with others.

Experience. —

(*c*) PHYSICAL.

In press work there is continuous standing, working a one-sided treadle, except in the most modern electrically driven machines. The work with smaller machines is usually done sitting.

(*d*) METHOD OF ENTRY AND PROSPECTS.

Machine working is less highly skilled than hand ironing (*q.v.*), and is staffed from the calender department.

NOTES.

When the girls are required to specialise on one kind of machine ironing (*e.g.*, collar work) a separate analysis of the process is desirable.

OCCUPATION : Laundry Work. DEPARTMENT : Ironing .

PROCESS : Hand Ironer.

PROCESS DESCRIPTION.

(*a*) GENERAL.

Finer body linen and the finishing processes in heavier articles are done by hand ironers. There is some specialising as *e.g.*, in shirt bodies, in pleating, and in fine articles according to the degree of skill required. The iron may be heated by electricity but gas is frequently used.

(*b*) PSYCHOLOGICAL.

Intelligence. C (for finer work).

Special. Attention to avoid scorching.
Visualisation of finished article.
Promptness of decision (as regards method).
Judgment and initiative more than most other laundry workers

Manual Skill. Movement L.Ehf$^{1\,2\,3\,4}$t$_2$f$_2^{1\,2\,3\,4}$Se
R.SbWsEh
Accuracy, C or B. Speed, A. Lightness of touch.

Temperament. Less monotonous than other processes.

Experience. Three months' training is generally sufficient.

(*c*) PHYSICAL.

Not too tall (standing), strong wrist, wiry type succeeds best. Work is physically exacting, requiring resistance to fatigue, standing, and hot gas-laden atmosphere.

(*d*) METHOD OF ENTRY AND PROSPECTS.

Learners at age 17 or 18 are placed under care of experienced worker, normally without pay during first month, then until proficient at suitable rates. When proficient they go on full piece rates. Good wages can be earned and successful workers become forewomen.

NOTES.

Examining is sometimes mentioned as a separate process but is often done by the finishers or by the forewoman. It involves examining the articles before they are sent to the packing room

OCCUPATION : Laundry Work. • DEPARTMENT : Despatching.

PROCESS : Packing.

PROCESS DESCRIPTION.

(*a*) GENERAL.

In the packing room different articles are distributed into racks allotted to the respective customers to whom they belong. (This is done by a junior). When a customer's rack is complete it is taken down and the contents are examined. They are checked against the customer's book and packed for delivery. The head packer sees that no damage has been done, and that special instructions have been carried out, and notes any errors or omissions.

(*b*) PSYCHOLOGICAL.

Intelligence.	C+
Special.	Taste and methodical arrangement, B. Attention to detail. Memory for customers' special instructions, etc.
Manual Skill.	Accuracy, C. Speed, B or A. Movements $t_2 f_2^{1\ 2\ 3}$Seh in arranging the articles. Lightness of touch.
Temperament.	Pleasant manner.
Experience.	Standard VI or better—some clerical work.

(*c*) PHYSICAL.

Walking, sometimes heavy lifting and carrying.

(*d*) METHOD OF ENTRY AND PROSPECTS.

Packing is usually given to girls of more ' refined ' type.

V.—USE OF OCCUPATION ANALYSIS BY THE VOCATIONAL ADVISER.

CLASSIFICATION OF OCCUPATIONS.

The value of a detailed occupation analysis such as the foregoing turns entirely upon its practical usefulness to the vocational adviser. Assuming that he has obtained a fairly accurate estimate of the capacities of the boy or a girl who seeks his advice, he has next to consider which of many occupations is likely to provide the best opportunities for success. It is unlikely that the estimate of qualities will indicate precisely one particular occupation to the exclusion of all others. It is more probable that the particular combination of qualities possessed by the child will be useful in several occupations which superficially may seem quite different. It is the vocational adviser's problem to say what these occupations are.

It is clear from the analysis of a number of occupations on lines such as the above, that the principal elements (viz., of intelligence, of skill, of temperament and character) are to be found in similar combinations in many of them. Hence the first step is to determine what combinations of qualities are required in a certain process or series of processes typical of many occupations. This may be decided by referring to the detailed process analysis. The next step is to compile lists of occupations in which processes (or series of processes) corresponding to these main types are to be found. With these to aid him, the vocational adviser is much better prepared for his task than if he only has a general description of the requirements of each occupation.

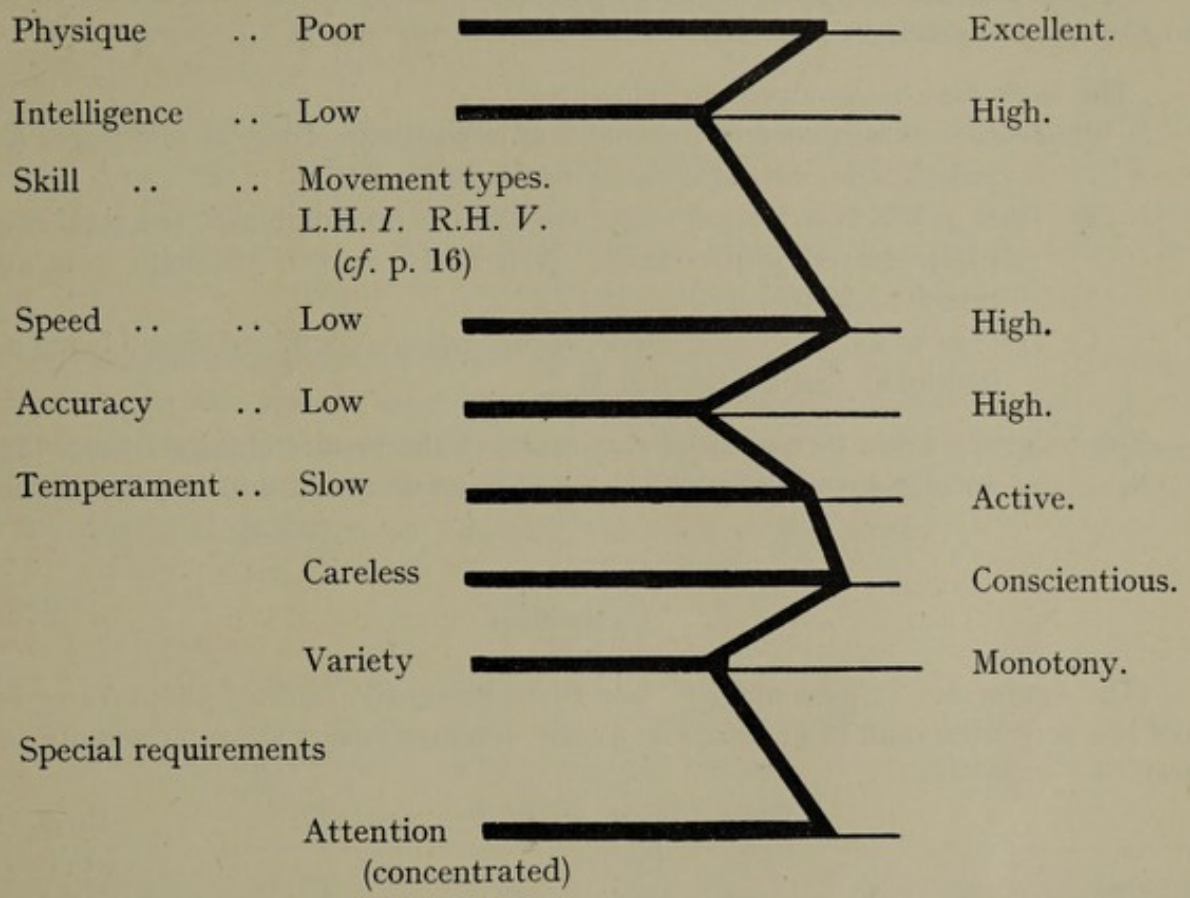
FORM OF RECOMMENDATION.

It folows, therefore, that in advising a child concerning his future it will often be more helpful to state the kind of process he ought to seek, with examples of the occupations in which they are to be found, naming the alternatives, than to select definitely one particular occupation. For example, a child may be advised to seek work in which intelligence, good memory for figures, ability to write and to calculate well, attention to detail, care and conscientiousness are essential qualities. This work is to be found in the receiving office of laundries, but is obviously also found in many other businesses or factories. The choice (from among several) will therefore chiefly turn upon opportunity, personal taste, prospects (where they differ) and similar conditions. The important point is, however, that this selection is made *primarily* not on the basis of prospects, but on the basis of suitability. The example given is stated in rather general terms, but the principle applies throughout.

PROCESS TYPES.

Many different classifications of occupations have been suggested from time to time, based separately upon physical requirements, scholastic attainments, manual and bodily skill, and so forth. It is apparent, however, that the vocational adviser requires a classification in which all these factors are taken into account.

Detailed analysis of occupations on psychological bases has not yet gone far enough for a list of typical processes to be compiled, but it will be useful to arrange the requirements of such processes in a systematic way. An arrangement such as the following is suggested for this purpose. The details are taken from the analysis of hand-ironing (page 28).



APPENDIX.

NOTE ON SOME TESTS OF MANUAL DEXTERITY.

Analysis of occupations has shown that skill in movement may be analysed into certain basic operations. Similar operations underlie a series of tests designed to measure the degree of manual skill which a person possesses.[1] They correspond closely to the list of types of skill given on page 15.

The tests may be grouped as follows :—

A. Tests in which control (tactual and kinaesthetic cues) of fine finger adjustments is important—vision not being used.

B. Tests in which wrist and finger movements are combined, the chief essential being dexterity in control. (Speed also enters, although it is not the principal factor).

C. Tests in which wrist and finger movements are combined, speed being a more dominant feature than in B.

The following table gives a brief statement of the results obtained from 124 girls and 146 boys between the ages 13 years 9 months and 13 years 11 months.

TABLE I.

(The figures are in percentages. Good is a percentile rank of about 73 or better. Poor is a percentile rank of about 33 or worse. Average covers the intermediate percentiles).

	Boys. Per cent.	Girls. Per cent.		Boys. Per cent.	Girls. Per cent.
Good A, good B, good C ..	8.3	5.0	Poor A, poor B, poor C ..	9.3	4.1
Good A, avge B, avge C ..	5.7	5.0	Poor A, avge B, avge C ..	4.3	6.7
Good A, poor B, poor C ..	4.3	3.3	Poor A, good B, good C ..	0.7	0.8
Good A, good B, avge C ..	2.1	1.7	Poor A, poor B, avge C ..	2.1	0.8
Good A, poor B, avge C ..	1.4	1.7	Poor A, good B, avge C ..	1.4	0.8
Good A, avge B, good C ..	0.7	5.9	Poor A, avge B, poor C ..	3.6	3.3
Good A, avge B, poor C ..	2.1	4.2	Poor A, avge B, good C ..	4.3	0.8
Good B, poor C, poor A ..	1.4	1.7	Poor B, good C, good A ..	0.7	0.8
Good B, good C, avge A ..	7.1	10.0	Poor B, poor C, avge A ..	3.6	5.9
Good B, poor C, avge A ..	0.7	0.0	Poor B, good C, avge A ..	3.6	1.7
Good C, avge A, avge B ..	5.0	9.2	Poor C, avge A, Avge B ..	7.9	11.7
Good C, poor A, poor B ..	2.9	0.0	Poor C, good A, good B ..	0.0	0.0
Avge A, avge B, avge C ..	8.2	5.7			

[1] A detailed account of these test is in course of preparation.

It will be seen that

(*a*) The 'all-round' percentages—good, poor and average together—are respectively for boys 26 (8.3, 9.3, 8.2) and for girls 14.8 (5.0, 4.1, 5.7).

(*b*) Good ability in the movements of any one group is combined with various degrees of ability in the movements of the other groups. In all cases, however, the largest percentages occur where the combinations are not too extreme.

(*c*) There is a closer connection between the skill in movements of group B and group C than between those of group A and group B or group A and group C. This is to be expected, because although speed is most important in group C it is not unimportant in group B. Conversely dexterity in finger movement is not unimportant in giving speed in group C.

The conclusions suggested by these figures are, of course, at present merely tentative, but they support the general view that skill in movements of different types must be treated separately. In other words manual dexterity is not so much a matter of *general* but of special skills of different kinds. These special skills may be of considerable importance in vocational guidance, as the following table clearly shows :—

TABLE II.

	Group A. Mean score as percentile rank.	Group B. Mean score as percentile rank.	Group C. Mean score as percentile rank.	Tests in which particular excellence is shown.
Carriage Builders	65	82	70	Finger and wrist twisting.
Tailors	85	77	66	Tactual discrimination.
Silversmiths ..	85	90	87	Hinging and turning movements of wrist.
Bookbinders ..	77	80	61	(N.B.—Poor speed).
Compositors ..	90	87	85	All fine finger movements.
Engineers	85	75	82	Tactual discrimination and speed of separate movements.
Cabinet makers ..	75	80	75	
School children ..	50	50	50	

The above table shows the comparative results for different groups of students in Junior Technical Schools (first or second year). The mean score for each group is expressed as a percentile rank on a scale obtained mainly from the examination of elementary school children of approximately 14 years of age. Most of the students in the Junior Technical Schools were of ages 14.5 to 15.5 ; a few were older. The columns A, B, C correspond to the groupings of movements, given above.

It will be seen that with few exceptions the technical school students obtain percentile ranks of 70 and over. Details are also given of special skill possessed by the different groups as shown by the tests which were used. The connection between these results and the kind of skill required in the occupations mentioned is sufficiently close to indicate that these differences are not the effects of chance. They may be the effects either of training, or of a process of selection by which the best trainees are obtained. (This would be a useful subject for further enquiry).

We may therefore conclude that the differences between children in the matter of ability in certain types of movement are not without Vocational significance. Consequently every study of occupations in which manual skill is an important feature should aim at as complete an analysis of the basic movements as possible. It should then be possible to bring the needs of the occupations and the skill of the individual into more effective relation, by recommending for training only those whose natural abilities will facilitate their acquirement of the skill desired. Studies such as those illustrated in the foregoing pages are indispensable if such an aim is to be achieved.

National Institute of Industrial Psychology

PRIVILEGES OF MEMBERSHIP

1 You will be entitled to *priority of consideration* in regard to the following functions of the Institute :

(1) The undertaking, on behalf of Industrial and Commercial Firms, of private investigations and subsequent supervision in regard to : (*a*)—Movements of the Worker. (*b*)—Selection of the Most Suitable Workers for Different Kinds of Work. (*c*)—Arrangement of Material. (*d*)—Methods of Training. (*e*)—Efficiency of Illumination, Ventilation, etc. (*f*)—Methods of Payment, Incentives, etc. (*g*)—Increase of Interest and Reduction of Monotony. (*h*)—Distribution of Periods of Work and Rest. (*i*)—Salesmanship, Advertisement, Designs, etc.

(2) The training of suitable members of a firm's staff in movement study, time study, vocational selection, etc.

2 You will regularly receive, post free, the Institute's publications, including copies of its quarterly *Journal*, describing in non-technical terms the most modern principles employed and the most recent results obtained in the application of up-to-date physiological and psychological knowledge to the human aspects of industry and commerce throughout the civilised world.

3 You will be entitled to nominate individual cases for vocational guidance at the Institute, *at half the usual fee, i.e.*, at 1½ guineas instead of 3 guineas.

4 You will be invited to take part in the special visits arranged to important factories and institutions, including some of those in which the Institute has carried out investigations.

5 You will receive invitations to special lectures, discussions and demonstrations at the Institute and to general conferences on the problems of Industrial Psychology.

6 You will be entitled to use the Institute's Reference and Lending Library.

7 You will be entitled to attend at *half the usual fee*, lectures on the subjects falling within the purview of this Institute, arranged by the Institute at the London School of Economics.

APPLICATION FOR MEMBERSHIP

I WISH to become a member of the Institute and to receive the current and future issues of its Journal and its other publications. I am willing to subscribe £.....annually,* and to give a donation of £..... towards the Funds.

(Please write distinctly.) *Name*.....

Address.....

.....

The Secretary, National Institute of Industrial Psychology, 329, High Holborn, W.C.1.

Date.....

**MINIMUM ANNUAL SUBSCRIPTION, ONE POUND. First subscription should accompany this application.*

I.R.I.

OFFICERS AND COUNCIL.

President—
The Rt. Hon. The Earl of Balfour, K.G., O.M., F.R.S.

Vice-Presidents—
The Rt. Hon. Viscount Haldane, K.T., O.M., F.R.S.

Chairman—H. J. Welch.
Director—C. S. Myers, C.B.E., M.D., Sc.D., F.R.S.

Council and Advisory Board—

The Rt. Hon. Lord Askwith, K.C.B., K.C., D.C.L.
P. B. Ballard, M.A., D.Litt.
Sir Robert Blair, M.A., B.Sc., LL.D.
John Baker, F.F.I.
F. C. Bartlett, M.A.
Sir William Beveridge, K.C.B., M.A., B.C.L.
W. Brown, M.D., Sc.
*C. Burt, M.A., D.Sc.
E. P. Cathcart, M.D., D.Sc., F.R.S.
*Edgar L. Collis, M.D., M.R.C.P.
*Winifred C. Cullis, O.B.E., D.Sc.
C. T. Cramp.
E. R. Debenham.
James Drever, M.A., B.Sc., D.Phil.
Beatrice Edgell, M.A., Ph. D.
Sir Walter Fletcher, K.B.E., M.D., F.R.S.
G. H. Gater, C.M.G., M.A.
*The Rt. Hon. Wm. Graham, M.P., M.A., LL.B.
Arthur Greenwood, M.P., B.Sc.
Sir Richard Gregory, D.Sc., F.R.A.S., F.Inst.P.
Sir Robert Hadfield, Bart., Sc.D., F.R.S.
Sir William Hardy, M.A., Sec.R.S.
Henry Head, M.D., F.R.S.
*W. L. Hichens.
A. V. Hill, Sc.D., F.R.S.
Leonard A. Hill, M.B., F.R.S.
S. S. Isaacs, M.A. (Mrs.)
D. T. John.
Ll. Wynn Jones, M.A., Ph.D.
C. W. Kimmins, M.A., D.Sc.
*Kenneth Lee, LL.D.
Sir Lynden Macassey, K.B.E., K.C., LL.D.
J. J. Mallon, M.A.
*Sir John Mann, K.B.E.
*F. J. Marquis, M.A., B.Sc.
Loris E. Mather.
G. K. Menzies, M.A.
J. L. McIntyre, O.B.E., J.P., M.A., D.Sc.
B. A. McSwiney, M.B., B.Ch.
Sir William Noble, Bart., J.P.
T. Percy Nunn, M.A., D.Sc.
Sir John Parsons, C.B.E., D.Sc., F.R.S.
S. W. Pascall, J.P.
T. H. Pear, M.A., B.Sc.
Sir E. Cooper Perry, M.D., F.R.C.P.
*W. Piercy, C.B.E., B.Sc.
*B. Seebohm Rowntree, J.P.
*Julius Salmon.
H. Gordon Selfridge.
The Rt. Hon. Tom Shaw, C.B.E., M.P., J.P.
*C. Spearman, Ph.D., F.R.S.
F. H. Spencer, D.Sc.
E. H. Starling, C.M.G., M.D., F.R.S.
The Rt. Hon. Sir Arthur Steel-Maitland, Bart.
G. H. Thomson, Ph.D., D.Sc.
*S. C. Turner, F.C.I.I.
C. W. Valentine, M.A., D.Phil.
*D. R. Wilson, M.A.
*R. M. Wilson, M.B., Ch.B.
*Sir Robert Witt, C.B.E., F.S.A., M.A. (*Vice-Chairman*).

* Executive Committee.

Assistant Director—George H. Miles, D.Sc.

Secretary—F. W. Lawe, M.A., F.S.S.

Hon. Solicitors—
Stephenson, Harwood & Tatham, 16, Old Broad Street, E.C.2.

Hon. Auditors—
Mann, Judd, Gordon & Co., 8, Frederick's Place, Old Jewry, E.C 2

Printed by J. W. Vernon & Co. Ltd., St. Albans & London