

EVOLUTION AND BRITISH PSYCHOLOGY

The Influence of Charles Darwin's Theories on Psychology
in Britain between 1858 and 1910

by

Allison M. Turtle

PSYCHOLOGY REFERENCE LIBRARY
UNIVERSITY OF SYDNEY

Thesis submitted to the Faculty of Arts in the University
of Sydney in partial fulfilment of the requirements for
the degree of Master of Arts.

C O N T E N T S

	Page
Synopsis	(a)
Preface	(e)
INTRODUCTION	1
DARWINISM	5
BACKGROUND AND RECEPTION	15
<u>The Expansion of Evolution</u>	15
<u>The Situation of Psychology</u>	23
Associationism	23
Psychology of the 1850's	31
Verdict of the Enlightened	42
MENTAL EVOLUTION	46
<u>Implications</u>	46
The Status of Higher Mental Processes	46
The Relation of Body and Mind	48
A Science of Behaviour	53
"Darwin versus Lamarck" ¹	56
<u>Procreation</u>	70
<u>Applications</u>	79
The Course of Mental Development	79
Observable Stages in Mental Development	88
MIND AS FUNCTION	101
THE MEASUREMENT OF MAN	113
CONCLUSION	124
Bibliography	i - ix

S Y N O P S I S

The extent of Darwin's influence on British Psychology may be estimated by a comparison of the situation for a period before and after the publication of his central theory in 1858 - 1859, by an examination of the frequency with which his ideas or modifications of them appeared in the psychological output for fifty years after 1858, and by a consideration of the relative importance of his theories for the work of the major writers of the period.

As Darwin wrote primarily from the viewpoint of biology proper, any influence of his writings on psychology must have been indirect. His contribution of relevance to psychology consisted in: firstly, an affirmation of the theory of descent with modification plus a convincing statement of related evidence; secondly, the propounding of a means of modification in the theory of natural selection; and thirdly, the admission of other possible means of modification such as the inheritance of functionally-acquired characteristics. The latter hypothesis, which exercised brief but extensive influence and partly countered that of the natural selection hypothesis, cannot be regarded as Darwin's original contribution, nor was he its chief exponent in the nineteenth century. Darwin did not apply his theories to the history specifically of man and of human mental process until 1871 (The Descent of Man), by which time several of his colleagues had anticipated him. His role relating to the theory of evolutionary descent was essentially that of popularizer, though for all practical purposes he was the originator of the particular thesis of natural selection.

Psychology in the middle nineteenth century was well prepared for the adaptation of Darwin's ideas. The associationists James Mill and John Stuart Mill found difficulty in describing the synthesis of complex mental states

solely in terms of association. The fact of mental continuity was affirmed by several, convinced by psychological observation as well as by deduction from comparative physiology. Herbert Spencer in 1855 provided a detailed description of the course of mental development, with an explanation of its process in terms of the inheritance of acquired modifications (the hypothesis of Lamarck); at the time his work made little impact. Until the 1870's, however, after the publication of The Descent of Man and of the second edition of Spencer's Principles of Psychology (which incorporated the theory of natural selection in the substance of the earlier edition), psychologists for the most part hesitated to utilize the theory of evolution. As both Darwin and Spencer relied on the Lamarckian hypothesis as well as on the theory of natural selection, it is difficult to distinguish the part played by their respective books in promoting the spate of evolutionary writings that followed them. But the success of Spencer's second edition as compared with the reception of the first may be ascribed to the intervening publication of The Origin of Species.

Very few psychologists maintained for long, in the face of zealous demonstration by Darwin's converts of the fact of continuity of the mental processes of all species including man, that the higher mental processes have a unique status, and are not susceptible to scientific explanation. Darwin passed naturally from the theory of organic evolution to that of mental evolution by treating mental process as behaviour of the organism. None of his immediate followers did the same, though later in the century a few writers abandoned introspective techniques as being incompatible with the study of comparative psychology or with a physiologically-orientated approach. The most popular means of transition from organic to mental evolution was by way of the metaphysical "dual aspects" theory of mind and body, which was coming into fashion before 1858.

The hypotheses of natural selection and of the inheritance of acquisitions were both in evidence in the works of most writers after 1870, though between 1880 and 1899 the Lamarckian principle diminished greatly in popularity. The relationship between instinct and intelligence came to be viewed as one of antagonism instead of as one of continuous development of one from the other (opinions varies as to which came first) - and of such a situation natural selection at the time offered the only solution.

In consequence of the acceptance of the theory of mental evolution, and partly in connection with the propaganda for it, the field of psychology underwent an enormous expansion. Areas which previously received only cursory attention became of interest in themselves, and also as throwing light on the mental processes of the traditional subject of psychology - the normal, adult, civilized man. The course of mental development was plotted in genetic psychology, and stages in mental development were studied in the comparative psychologies of human races and of animals, in child psychology, mental pathology, in the history of civilization and of language. Many writers treated the individual differences obtaining among men as representative of different stages of mental evolution.

Between 1858 and 1910, mental process to a small extent came to be treated as a function of the organism. Partly this attitude may be attributed directly to the emphasis in the theory of natural selection on the fact that survival of the organism depends on adaptive behaviour. But partly this approach resulted from the treatment of mental process by evolution-minded physiologists, who were influenced by the facts that mental development seems to depend on neuro-physiological development and that mental functions can be localized in the brain, and by the contention (advanced by Lewes) that all living tissue has the property of sensibility, the basis of mind in its objective aspect. The popularity of Spencer's description of the relationship between mind and

the environment in terms of correspondence partly ~~the~~ obviated the necessity for a functionalist approach, and the lingering vestiges of hedonistic interpretation of behaviour weighed against it.

As a direct result of the importance in the theory of natural selection of the inheritance of spontaneously-arising variations, Francis Galton, motivated by an interest in eugenics (a speeded-up and improved natural selection of man), pioneered the systematic study of human individual differences and their inheritance. To this study he brought refined techniques from the independently expanding area of statistics. From it arose the problems of the relative contributions to the individual of nature and nurture, of methods of mental measurement, and of the definition of what is measured.

Although many of the processes by which Darwin's influence made itself felt cannot be traced, though his personal significance may not have been great, and though the way was paved for his theories by developments in psychology and out of it, he was the agent of theories which received universal attention from psychologists between 1870 and 1910. For many these views became integral to their study of mental process, and the subject-matter of psychology was expanded to accommodate them, with consequent modifications in methodology and technique. Darwin's own personal applications of evolutionary theory to mental process served not as a model for others, but only as inducement to proceed with their own deductions.

P R E F A C E

It was intended that this thesis be based on a comprehensive survey of all the psychological productions of the period in Britain. Inductive generalizations about the past, which do not permit of experimental falsification, can only be significant if made on the basis either of highly reliable sampling, or of a study of the total information available. Bias in sampling material of this nature seems inevitable; it is therefore desirable to keep selection of material initially considered at a minimum. The material actually used in illustration must of course be selected.

This intention has not been realized - although the psychological output in Britain between 1858 and 1910 was not immense. Only British writers have been considered, although they often followed in the footsteps of European and American psychologists, and although non-British writers at times published within Britain. The scattered contributions of psychologists throughout the general periodical literature of the nineteenth century (in journals such as The Contemporary Review, The Fortnightly Review, Nature, and The Westminster Review) have been sampled quite at random. In several cases, particular editions of books were unavailable, and it has been necessary to rely on later editions, sometimes published after 1910. The subject-matter dealt with was partly defined by a pruning of all metaphysical material. Other omissions have probably been made; even though none of these may be particularly significant, it cannot be claimed that the material considered here is exhaustive.

No particular importance attaches to 1910, the closing date of the material treated. Fifty odd years is a reasonable length of time to allow for even radically new ideas to influence patterns of academic thought. It is not thought necessary in an historical exposition to evaluate the worth or signif-

icance of any of the writings of the period either in any absolute sense, or as related to the history of psychology after 1910.

I would like here to acknowledge the large contribution to this thesis made by my supervisor, Professor W. M. O'Neil, who suggested the topic, stimulated its development, and sampled the rough draft.

INTRODUCTION

When the views advanced by us in this volume, and by Mr. Wallace, or when analogous views on the origin of species are generally admitted, we can fairly foresee that there will be a considerable revolution in natural history Psychology will be severely based on the foundation already well laid by Mr. Herbert Spencer, that of the necessary requirement of each mental power and capacity by practice. Much light will be thrown on the origin of man and his history.*

When Charles Darwin² made his original statement on the fact and means of the origin of species in 1838, and published it in book form in 1859, he did not find it necessary to refer to psychology at all. After his attention had been directed to the attempt of Herbert Spencer³ to infuse psychology into the notion of gradual development of species, and a consideration of the origin of the human species had been forced upon him by publication of collections of evidence, Darwin found himself obliged to modify his exclusive position somewhat. His introduction of mind as mental processes and behaviour was biological in viewpoint, and his speculation as to the future of psychology was limited to the statement quoted above. (Two exceptions, essays on the expression of the emotions and child development, dealt with very specific areas of psychology.) Although Darwin included psychology among the natural sciences, its position in 1859 was marginal, so that any influence exerted by Darwin's biological concepts and methods on psychology could only be indirect.

The subject of Darwin's "influence" on British psychology can be treated in various ways. The topic could be narrowed, and the psychological state of the biological mind in evolutionary methods to theories biological and related to Darwin's theory could be examined on a quantitative basis, to

1. Darwin, C.: *The Origin of Species*, 1859, pp. 300, 304, vol. 1.

2. CHARLES DARWIN, *Naturalism*, 1809-1862.

3. HERBERT SPENCER, *Philosophy*, 1820-1903.

INTRODUCTION

"When the views advanced by me in this volume, and by Mr. Wallace, or when analogous views on the origin of species are generally admitted, we can dimly foresee that there will be a considerable revolution in natural history Psychology will be securely based on the foundation already well laid by Mr. Herbert Spencer, that of the necessary acquirement of each mental power and capacity by gradation. Much light will be thrown on the origin of man and his history."¹

When Charles Darwin ² made his original statement on the fact and means of the origin of species in 1858, and published it in book form in 1859, he did not find it necessary to refer to psychology at all. After his attention had been directed to the attempt of Herbert Spencer ³ to infuse psychology with the notion of gradual development of species, and a consideration of the origin of the human species had been forced upon him by publications of colleagues and opponents, Darwin found himself obliged to modify this exclusive position somewhat. His fairly brief treatment of human mental processes and behaviour was biological in viewpoint, and his speculation as to the future of psychology was limited to the statement quoted above. (Two exceptions, essays on the expression of the emotions and child development, dealt with very specific areas of psychology.) Although Darwin included psychology among the natural sciences, its position in 1858 was equivocal, so that any influence exerted by Darwin's biological concepts and comments on psychology could only be indirect.

The subject of Darwin's "influence" on British psychology can be treated in various ways. The topic could be reversed, and the psychological fate of the biological concept of evolution discussed. Deductions made by psychologists from Darwin's theory could be examined on a quantitative basis, to

1. Darwin, C.: The Origin of Species, 1888, pp.300,304, vol. 1.

2. CHARLES DARWIN, Naturalist, 1809-1882.

3 HERBERT SPENCER, Philosopher, 1820-1903.

establish their frequency of occurrence. The background to these deductions could be considered, in order to determine how and why the theory exerted its influence (such an approach would assume a greater knowledge of the mental content and process of the Victorians than is available).

The approach to the topic in the present work is a compound of the above methods. The state of British psychology before 1858 is compared with its state after 1858 on a very general quantitative basis and a more detailed qualitative one. The deductions made and implications drawn from Darwin's theory are traced in their patterns of development in the emerging different fields of psychology, and here individual writers are selected for particular attention on the basis of extensive or original output. Conclusions regarding the significance of different aspects of Darwin's work for psychology up to 1910 are drawn, then, partly from the extent to which these aspects appear to have influenced men held for different reasons to have been of importance in the period, and partly from the extent of their overall influence.

In general, historians of psychology are agreed that Darwin's influence on their field was considerable. Aspects of the theory with particular relevance to psychology are mentioned, such as the continuity of species, heredity and adaptation.¹ The development of new fields of psychological research - animal, developmental and differential - is pointed to,² and the methodological conversion to experimental and objective techniques.³ No very detailed treatment of the whole matter has yet been given, and it seems that to some extent the problem has been over-simplified. Modern knowledge of natural history and genetics minimizes the number of interpretations that can be placed on Darwin's

1. Murphy, G. Historical Introduction to Modern Psychology, 1949, p.107.

2. Boring, E. G. A History of Experimental Psychology, 1957, pp.471-8.

3. Kantor, J. R. "Evolution and the science of psychology," Psychol. Record, vol. 9, 1959, p.136.

hypotheses. But these hypotheses were not in 1858 set out in any very formal fashion, and were in some cases only tentative, and subject to alteration by the author. Inadequate data and ready speculation allowed the theory to be utilized or disposed of in a variety of ways.

Both method and matter of psychology altered between 1858 and 1910. As it will be argued that Darwin was partly responsible for this change, a definition of "psychology" will be developed during the thesis, and not be given here. For working purposes, it may be said that the material considered deals in some fashion (excluding only the metaphysical line) with human or animal mental process or behaviour. The separation of psychological topics into different fields for the purposes of exposition is perhaps more rigorous than the state of the subject in the nineteenth century justifies.

Any estimate of the extent and status of psychological work during the period from 1858 to 1910 of course depends on the definition given of psychology. The loose definition here adopted includes over forty different writers, as well as the spate of experimental workers who published in The British Journal of Psychology when it first appeared in 1904, and the research assistants and students of Karl Pearson. None of these men, apart from a handful of academics, were psychologists by profession, and only a few by full-time interest; they included medicos, physiologists, zoologists, philosophers and statisticians. The first psychological journal, Mind, which appeared in October 1875, had a private founder and supporter, Alexander Bain. The British Psychological Society was founded in 1901 by ten members, and in 1914 only numbered seventy-nine. By 1904 there were six academic posts in psychology in Britain, including only part of one chair, the Grote Chair of Mind and Logic at London University, founded in 1892. Two small psychological

laboratories were established in 1897 at Cambridge and the University College, London; in 1907 a third opened at Edinburgh. This situation was slow to change. Psychology did not warrant admission even as a subsection in the Proceedings of the British Association for the Advancement of Science until 1920 (although it had previously occupied space in the Anthropology Section).

It would not be surprising if a psychology, poor in numbers and recognition, was subject to domination by trends fashionable in other fields. The influence of very general attitudes, materialism and hedonism, is often mentioned, and also the contribution of data and methodology of special subjects, such as physiology, embryology and cytology. The psychologists of the latter nineteenth century were, however, prolific in output, and very conscious of their role in developing an independent field of study. Any influence of Darwinian theory, which included both general and specific information, must be traced in the light of the consideration that the field was in its own right a developing and expanding one.

DARWINISM

Although Darwin began his major research in the 1830's, it was not until 1859, when *On the Origin of Species* was published, that his ideas were widely known. The book was published by the London Society of Naturalists, and it was the first of a series of papers. In 1871 Darwin published his second major work, *The Descent of Man, and Selection in Relation to Man*. Darwin's views were at first almost identical with those of Wallace, but from a very early stage their joint theory of natural selection was attributed to Darwin. Darwin in 1881 was better known than Wallace, who himself always referred to the theory of natural selection as "Darwinism". Darwin's influence on psychology was not limited to the theory of natural selection, but extended to the whole of his work. The theory of evolution, as Darwin's theory was called, was not central to all of Darwin's work. The theory of evolution, as Darwin's theory was called, was not central to all of Darwin's work. The theory of evolution, as Darwin's theory was called, was not central to all of Darwin's work.

DARWINISM

In *The Origin of Species* Darwin's theory fell into two sections. Firstly, it was an exposition of the fact of evolution, in which Darwin gave the specific meaning of continuity of species, or descent with modification, as he called it. He showed that all the organisms of the present are descended from one or a few ancestral forms. The evidence adduced was a combination of the facts of the fossil record and the facts of the present world. In the second volume of *The Descent of Man*, Darwin's theory was applied to the human race. He showed that man is descended from an ancestral form, and that the human race is a result of the process of natural selection. Secondly, the theory offered an explanation of the facts of the fossil record, and of the present world.

DARWINISM

Although Darwin began his major research in the 1830's, it was not until 1858, when papers by him and Alfred Russell Wallace¹ were read before and published by the Linnman Society of London, that his ideas made any public impact. In 1859 Darwin published his conclusions, with detailed evidence, in two volumes, The Origin of Species by Means of Natural Selection. Wallace's views were at first almost identical with those of Darwin, but from a very early stage their joint theory of natural selection was publicly accredited to Darwin. Darwin in 1858 was better known than Wallace, who himself always referred to the theory of natural selection as "Darwinism;" Darwin readily undertook the role of popularizer, and published far more extensively in the area than his colleague. The issue of evolution by means of natural selection was not central to all of Wallace's work as it was to Darwin's. Throughout the period studied, Darwin's name received much more frequent reference than did that of Wallace, so that it seems reasonable to consider primarily Darwin's influence on psychology, and his views in detail.

In The Origin of Species Darwin's theory fell into two sections. Firstly, it was an assertion of the fact of evolution, to which Darwin gave the specific meaning of continuity of species, or descent with modifications of all species from one or a few ancestral forms. The evidence adduced was a demonstration of the inter-relations among all forms of organic life, which was given in the second volume by examples of geological succession, geographical distribution, mutual affinities of organisms both embryonic and mature, and of vestigial structures. Secondly, the theory offered an explanation of these

1. ALFRED RUSSELL WALLACE - Naturalist, 1823-1913.

modifications, and thus of the origin of species.

The thesis of descent required postulates as to inheritance and variation. Each cell, Darwin stated, tends to resemble the parent cell, but also to vary. In 1858, such variation was said to be chiefly random and spontaneous, and Darwin advanced no theory to account for it. Given this fact of variation within resemblance, Darwin had only to add Malthus's postulate of the never-ending pressure of population, to enable him logically to deduce natural selection as the causal explanation of evolution:

"As many more individuals of each species are born than can possibly survive, and as, consequently, there is a frequently recurring struggle for existence, it follows that any being, if it vary however slightly in any manner profitable to itself, under the complex and sometimes varying conditions of life, will have a better chance of surviving, and thus be naturally selected. From the strong principle of inheritance, any selected variety will tend to propagate its new and modified form." 1

This principle Herbert Spencer summarized as "survival of the fittest." Fitness was described by Darwin in terms of structure, constitution and instinct, and the struggle for survival takes place primarily between members of the same species. An accumulation of selected variations is required to produce a new species, which will not result from chance variations alone.

The principle of natural selection rested largely on a deductive basis. Evidence presented by Darwin bore mainly on the two premisses - the variability of species in a state of nature, and the struggle for existence following on the high geometrical ratio of increase in the number of organic beings. The whole process of the origin of species was illustrated by the analogous process of variation and selection under conditions of domestication.

The ultimate result of natural selection is that organisms tend to improve in relation to their surroundings, and to advance in organization. (Darwin,

with Von-Baer, defined 'organization' as "the amount of differentiation of the parts of the same organic being and their specialization for different functions!"¹) There is no innate tendency to advancement per se. For convenience, Darwin and his followers often spoke of natural selection as though the process were an agent, but apparently without confusion as to its status as an explanatory principle.

Darwin's chief emphasis in accounting for the origin of species was always on the process of natural selection of spontaneously occurring variations. Because of the originality of the theory, this emphasis has sometimes been mistaken for an exclusive one. However, the Introduction to the first edition of The Origin of Species concluded with the statement:

"I am convinced that Natural Selection has been the most important, but not the exclusive, means of modification."

No modifying agency other than natural selection was specifically mentioned by either Darwin or Wallace in 1858 or 1859. In 1868, following pressure from critics and colleagues, Darwin suggested several sources of variation other than chance:

"Variations in the organization will in some cases be aided by habit, or by the use and disuse of parts, and they will be governed by the direct action of the surrounding physical conditions and by correlation of growth."²

The variations due to the use and disuse of parts were not always treated just as material for natural selection to act upon, but, being inheritable, were considered to constitute a completely independent means of modification themselves.³ By 1872, the operation of natural selection was restricted to adaptive modifications of structure, instead of to every detail of structure.⁴

A new process, sexual selection (by which those members of the species preferred

1. ibid., vol. 1, pp.151-2.

2. Darwin, C.: Variations of Animals and Plants under Domestication, vol. 1, p.7

3. ibid., vol. 2, p.27.

4. Darwin, C.: The Descent of Man and Selection in Relation to Sex, vol. 1, pp.152-3

by the opposite sex for mating activities have the highest rate of reproduction) was postulated to account for the acquisition in the species of various characters non-essential for the survival of the individual. Other factors on a similar functional level to natural selection, though in fact of less importance than it, were the inheritance of useful acquired modifications and of variations correlated for some unknown reason with those chance ones naturally selected.¹

By the time of the sixth edition of The Origin of Species, Darwin reached a definite modification of his original position. The primary source of variation for him was still chance, or spontaneous variation - no mechanism was postulated. But other variations were due to the direct effect of changed conditions in the environment, to variations in structures correlating with those accumulated by natural selection, and to the acquired effects of use and disuse.² Darwin remained vague as to the possibility of sexual reproduction giving rise to new variations.³ The status of the acquired variations was indeterminate; partly they served as extra material for natural selection to operate up on, and partly the inheritance of acquisitions was a causal agency in its own right. In any particular case, the practical difficulties of distinguishing the independent roles of natural selection and the inheritance of functionally-arising modifications was insuperable. Darwin finally decided that:

"On the whole, we may conclude that habit, or use and disuse, have, in some cases, played a considerable part in the modification of the constitution and structure; but that the effects have often been largely combined with, and sometimes overmastered by, the Natural Selection of innate variations."⁴

The theory of natural selection, with its supplementary factors, only

1. ibid., vol. 1, ch. 4.

2. C. Darwin: The Origin of Species, vol. 1, ch. 5.

3. Darwin, C.: The Variation of Animals and Plants, vol. 2, p.264.

4. Darwin, C.: The Origin of Species, vol. 1, p.177.

explained which properties of the organism are in a position to be transmitted to the offspring, and not how this transmission takes place. Darwin did develop his own theory of the mechanism of inheritance, and described various phenomena involved, such as reversion to an ancestral form. His hypothesis of 'Pangenesis' was not held with sufficient confidence to be included in any edition of The Origin of Species, but was described in The Variation of Animals and Plants under Domestication in 1868.¹ Here Darwin maintained that all cells throw off minute atoms or gemmules, which circulate in the body, multiply by self-division, and ultimately develop into cells like those from which they originated. These cells are united in the reproductive organs; in sexual reproduction, the male element acts directly on the female reproductive organs, thus causing modification of the female gemmules. - This theory clearly lent itself to the hypothesis of the inheritance of the effects of use and disuse, and of the direct action of the environment.

In his initial statements concerning the evolution of species, Darwin diplomatically avoided direct reference to the human species - while maintaining that his theory had general application. It was left to various of his colleagues to make the first statements as to the biological evolution of man based on Darwinian theory. In 1860 and 1862, T. H. Huxley made explicit Darwin's implicit conclusions regarding the evolution of man, in a series of lectures "On the relations of man to the lower animals." These were published in 1864, in a booklet entitled Evidence as to Man's Place in Nature. Huxley pointed to the structural affinities of man with the lower animals, both embryonic and adult, and to the difficulty of drawing even a psychical distinction of an absolute form between them. As fainting women were carried from the Museum Library, he declared:

1. vol. 2, pp.374ff.

"I asserted, and I repeat, that a man has no reason to be ashamed of having an ape for his grandfather."

He concluded that "even the highest faculties of feeling and of intellect begin to germinate in lower forms of life."¹

In 1864 Wallace published an essay on "The development of human races under the law of Natural Selection," in which he explained that racial diversity is due to the cessation of operation of natural selection on bodily characteristics at a certain stage, when mental development takes priority.² In 1865 Francis Galton³ began his investigations into human inheritance with a paper on "Hereditary talent and character,"⁴ where he stated:

"I shall treat of man and see what the theory of heredity of variations and the Principle of Natural Selection mean when applied to man."

In 1863 the geologist Lyell produced evidence in favour of the continuity of human with other species in The Antiquity of Man; in 1865 the social historian E. B. Tylor advanced evidence from his particular field, in Researches into the Early History of Mankind.

Controversy over human origin was also carried on at a non-scientific level - and continued to be throughout the period. Three general approaches to the problem were taken: firstly, that man, body and mind, is a creation separate from the animals; secondly, that the human body has evolved in accordance with organic laws, but that the human mind is a special creation; thirdly, that man has evolved, body and mind, according to discernible laws. In 1871, Darwin was finally persuaded to abandon his reticence, and in The Descent of Man, and Selection in Relation to Sex, expressed his adherence to the third of these positions.

1. Huxley, T. H.: Evidence as to Man's Place in Nature, p.108.

2. Published in Contributions to the Theory of Natural Selection, 1871, by A. R. Wallace.

3. FRANCIS GALTON, Sir - Private means; second cousin to Charles Darwin; 1822-1911.

4. MacMillan's Mag., vol. 12, pp.157-66, 318-27.

In this work Darwin presented evidence for the continuity of human with lower species, both mental and physical, similar in kind to that given in 1859 regarding just the lower species. Arguments for a similar mode of development for man as for the lower animals were adduced, in terms of natural selection and other modifying agencies, and evolutionary theories were applied to the existing different races of man.

The three chapters on human mental powers in The Descent of Man constituted essentially a comparative psychology. Darwin's main intention in including them was, however, propagandist; he was anxious to demonstrate the absence of any basic difference between man and the higher animals in mental faculty. He pointed to the existence in man and animals of the same sense organs, and thus of the same sensory intuitions, of the same instincts, the same emotions (including the more "intellectual" emotions of wonder and curiosity), the same behaviour processes (including imitation, attention, and learning by experience), the same mental processes - such as memory, imagination and reason, and the common use of language to communicate feeling. Evidence offered was anecdotal. The apparent difference between the human and the animal mind was ascribed to the development of those mental faculties which enable man to connect definite sounds with definite ideas. Language was held to have originated in instinctive animal noises and imitation of other sounds, but to have developed in consequence of certain brain changes. Thereafter, the effects of greater use of vocal and mental organs would have been inherited, and these organs would in this fashion have continued to develop.¹

Darwin thus very briefly dismissed the question of the origin of distinctively human mental faculties. The primary explanation of their development rested on the hypothesis of the inheritance of effects of use and disuse:

1. Darwin, C.: The Descent of Man, vol. 1, pp.54-8.

"The mental powers in some early progenitor of man must have been more highly developed than in any existing ape, before even the most imperfect form of speech could have come into use; but we may confidently believe that the continued use and advancement of this power would have reacted on the mind by enabling and encouraging it to carry on long trains of thought There is no more improbability in the effects of the continued use of the vocal and mental organs being inherited, than in the case of hand-writing, which depends partly on the structure of the hand and partly on the disposition of the mind; and hand-writing is certainly inherited."¹

"If it be maintained that certain powers, such as self-consciousness, abstraction, etc., are peculiar to man, it may well be that these are the incidental results of other highly-advanced intellectual faculties; and these again are mainly the result of the continued use of a highly developed language."¹

Various other faculties usually regarded as distinctively human Darwin either attributed to the higher mammals as well (sense of beauty, sociability, sympathy, self-control, love, possibly self-consciousness), or explained in terms of natural laws of evolution (belief in God and the moral sense). He briefly traced the passage from the primitive to the civilized mind in its intellectual and moral aspects. The development of intellect and morality was attributed to the joint operation of natural selection and of the inheritance of acquired modifications. Intelligence and social behaviour is of importance to the survival of man in opposition with other species, and hence those individuals displaying it would be naturally selected, and the habitual practice by them of arts and customs strengthens the faculties responsible for their performance.²

Although Darwin refused to define the term "instinct," in 1859 he ascribed it the status of "mental action." The origin of instincts was explained largely by the principle of natural selection, with the inheritance of habits playing only a secondary part: "The most wonderful instincts with which we are acquainted could not possibly have been acquired by habit."³

1. ibid., vol. 1, pp.57-8, 105.

2. ibid., vol. 1, ch. 5.

3. Darwin, C.: The Origin of Species, vol. 1, p.321.

In 1871, Darwin came definitely to the opinion that some intelligent actions, repeated over many generations, might lapse into the form of inheritable instinct, but that the more complex instincts originate independently of intelligence.¹ Thus there need be no inverse ratio between the proportions of instinctive and of intelligent behaviour, and no continuity in their relationship.

The work of Darwin which may be identified as wholly in the area of psychology was concerned only with very specific areas of human behaviour. In 1872 he published The Expression of the Emotions in Man and Animals, a description of three principles by which the phenomena of expression in all the higher mammals were supposed to be explained. The data for this work offered further evidence for the continuity of human with other species, and the first principle a further illustration of the theory of the inheritance of acquired modifications in action.¹ The book was in fact an early piece of comparative psychology. Emphasis was on the observation of physiological phenomena accompanying various mental states, not on the mental states themselves. A similar emphasis was apparent in the "Biographical sketch of an infant," of 1877,² where Darwin just described the development of the behaviour and inferred mental states of a particular child.

Darwin's theories were rich with implications for psychology, most of which he failed to consider himself. Those which he did discuss were mostly drawn to his attention by other writers. His main contributions of possible

1. This was the principle of serviceable associated habits, according to which certain complex acts have been previously of direct or indirect service to the animal when in certain states of mind, by relieving or gratifying certain sensations, desires etc., and so have been habitually performed. Inheritance of such habits results in the situation where whenever these states are induced in existing species, there is a tendency for performance of the associated movements, even though now they are of no service.

2. Mind, vol. 2, pp.285-294.

relevance and importance were the theory of descent with modification, relating to which he certainly performed most efficiently the part of popularizer, and the hypothesis of natural selection, of which he for all practical purposes was the originator. Darwin himself was influenced by others to emphasize the hypothesis of the inheritance of acquisitions, but though he undoubtedly propagated it, he was neither its originator nor its chief exponent in the nineteenth century.

DISCUSSION AND RECEPTION

THE RECEPTION OF DARWINISM

THE SITUATION OF PSYCHOLOGY

Associational Psychology of the 1870's Verdict of the Eighteenth

THE EXPANSION OF EVOLUTION

The status of evolutionary theory prior to 1859 is one of interest only insofar as it throws light on the significance of Darwin's contribution. It is necessary to consider the status of pre-Darwinian views of evolution, the extent to which these were known and accepted, and the publicity and acceptance accorded to Darwin's own theory.

The notion of evolution before 1859 had many different forms - change, biological transformation, continuity of life, gradual origin of species - and most of them have been traced back to ancient Greece. In European philosophy

BACKGROUND AND RECEPTION

THE EXPANSION OF EVOLUTION

THE SITUATION OF PSYCHOLOGY

Associationism Psychology of the 1850's Verdict of the Enlightened

When Thompson's *Range* in the eighteenth and first half of the nineteenth centuries was associated with the idea of descent with modification.¹ These centuries also saw a rapid expansion of the domains of biology, botany, physiology and paleontology.

The 18th of prominent natural authors on evolution began with the work of Charles Bonnet (1733-1793), though his outlook on evolution was very limited. While Bonnet believed in the continuity of all creation, from the mineral to the highest form of animal life, "evolution" in his terminology referred only to the development of the individual from the germ. The whole

BACKGROUND AND RECEPTIONTHE EXPANSION OF EVOLUTION

The state of evolutionary theory prior to 1858 is here of interest only insofar as it throws light on the significance of Darwin's contribution. It is necessary to consider the nature of pre-Darwinian views of evolution, the extent to which these were known and accepted, and the publicity and reception accorded to Darwin's own theory.

The notion of evolution before 1858 had many different forms - change, biological transformation, continuity of life, gradual origin of species - and most of these have been traced back to ancient Greece. In European philosophy began naturalistic methods of studying the problem; Bacon pointed to variation existing in the present day in animal and plant forms, and to the bearing of this situation on the production of new species, while Leibnitz offered the gradations of character between living and extinct forms as the proofs of a universal connection between species. The expansion of evolutionary theory in the inorganic sciences of astronomy and geology will not be discussed; the immediate predecessors of Darwin were naturalists, a number of whom throughout Europe in the eighteenth and first half of the nineteenth centuries were associated with the idea of descent with modification.¹ These centuries also saw a rapid extension of the sciences of zoology, botany, physiology and palaeontology.

The list of prominent modern writers on evolution begins with the name of Charles Bonnet (1720-1793), though his outlook on evolution was very limited. While Bonnet believed in the continuity of all creation, from the mineral to the highest form of animal life, "evolution" in his terminology referred only to the development of the individual from the germ. The whole

1. Especially Linnaeus, Buffon, Erasmus Darwin, Lamarck, Goethe, Treviranus,
(over)

of organic life was supposed to be contained preformed in the germ-cells of the first beings, with special provision by the Creator for variation (in the direction of improvement). The classification of plants and animals by Linnæus (1707-1778) did much to further the notion of relationship between species - even though each species was forced into a position exactly intermediate between two others. George Buffon (1707-1788) found it necessary to repudiate his own evidence for the mutability of species on theological grounds. He outlined a possible theory of common ancestry of horse, ass, ape and man which, he said, Biblical teaching renders impossible. His arguments adduced against his own early views (from the sterility of hybrids, absence of missing links between species, and lack of historical knowledge of the emergence of new species) probably checked the progress of evolutionary thinking.¹ But Buffon's theory as to the cause of mutability - the inheritance of changes produced by the direct action of the environment on bodily structures - was not forgotten. Erasmus Darwin (1731-1802), the grandfather of Charles Darwin and Francis Galton, produced evidence for the mutability of species and the origin of all of them from "a similar living filament," very like that presented by his grandson in 1858-9. Erasmus Darwin attributed variation to the direct effect of the environment, to the inherited effects of habit, and particularly to the spontaneous powers of development in response to needs planted within the original organisms by the Creator.

The theory of evolution most widely known before 1858 was that of

(contd. from p.15) - Cuvier, Isidore and Geoffroy St. Hilaire, St. Vincent, Vincy, Grant, Rafinesque, Dujardin, Chevreul, Gadran, Leidy, Unzer, Lecy, Wolff, Schaafhausen, Meckel, Von Baer, Serres, Herbert, Von Buch, Wells, Matthew, Naudin, Haldeman, Chambers, Owen.

1. Article by A. O. Lovejoy, published in Forerunners of Darwin: 1745-1859, ed. 1959 by Glass, B., Temkin, O., and Straus, W.L. Jr., expresses this opinion.

Lamarck (1744-1829). Lamarck first drew attention to the probability that all change in both organic and inorganic worlds is lawful. The causes of modification he assigned included the direct action of the environment, the effects of crossing, and, primarily, the inheritance of acquired modifications in structure due to habitual use or disuse of parts.¹ All species were believed to have descended by these means from one or more primordial forms, and to be progressing towards perfection. Lamarck's theory rested on two general propositions about Life: first, life tends by its inherent forces to increase the volume of each living body, and of all its parts, up to a level determined by its own needs; and second, new wants in animals give rise to new movements, which produce organs.² There is no necessary innate tendency to perfection. Lamarck's speculations were not very fully supported by observation. They were further developed by St. Vincent (1780-1846), but opposed by Geoffroy St. Hilaire (1772-1844) and Isidore St. Hilaire (1805-1861), who both attributed variations in species solely to the direct action of the environment. William Lawrence (1783-1867) likewise denied the inheritance of acquired modifications; inherited variation results from the operation of unknown factors.

J. W. Goethe (1749-1832) first employed evolution as a hypothesis in the interpretation of facts such as the existence of vestigial structures. Organisms were conceived as the product of the opposing forces of inheritance and variation.

-
1. An example of Lamarck's application of the hypothesis of inheritance of acquired modifications is the discussion of the origin of snakes:-
"Snakes sprang from reptiles with four extremities; but, having taken up the habit of moving along the earth and concealing themselves among bushes, their bodies, owing to repeated efforts to elongate themselves and to pass through narrow spaces, have acquired a considerable length out of all proportion to their width. Since long feet would have been useless, and short feet would have been incapable of moving their bodies, there resulted a cessation of use of these parts, which finally caused them to totally disappear." (Clodd, E.: Pioneers of Evolution, P. 53)
 2. ibid., p. 53.

The recapitulation argument from embryology adduced by Darwin in 1859 as evidence for the continuity of species (that the maturing embryo repeats rapidly in the course of its development all the stages of its ancestral evolution) was advanced in 1811 by the embryologist Von Baer (1792-1876).

Many aspects of Darwin's theory had been anticipated by about 1820, and much of his evidence presented by others before him. The theory of natural selection, commonly regarded as Darwin's original contribution, was actually originated in 1813. In that year Dr. W. C. Wells read before the Royal Society a paper which he published in 1818 on "An account of a white female, part of whose skin resembles that of a negro;" in it Darwin recognised the principle of natural selection applied to specific human characteristics.¹ In 1831, Patrick Matthew included a brief outline of a theory identical with that of Darwin and Wallace, applied to all species, in an Appendix to his Naval Timber and Arboriculture. However, both these works reclined in obscurity until after the publication of The Origin of Species in 1859.

With these numerous forecasts, the intellectual climate in Britain must have been ready for the inundations of Darwin and Wallace. Yet it appears that evolutionists of any variety were not particularly active about the middle of the nineteenth century. Richard Owen (1810-1892), the leading comparative anatomist of the time, in a confused manner put forward the idea of there being perfect typical forms ancestral to modern ones derived from them by modification. Dr. Grant and the Rev. W. Herbert separately published articles affirming the principle of modification of species, but with only very general discussions as to the means thereof. In 1844 Robert Chambers published anonymously The Vestiges of the Natural History of Creation, which went through ten editions in nine years. Written in popular form, this work rejected

1. In The Origin of Species, 6th edn., vol. 1, p.xvi.

Lamarckian ideas, attributing the progressive range of life throughout the universe to a divinely implanted impulse to advancement, combined with an impulse to modify organic structure in accordance with the environment. Although naturalists were unimpressed by the evidence offered, Wallace argued that Chambers influenced public opinion as to the extreme improbability of the independent creation of each species.¹ Yet at the same time Lyell was writing that facts in geology are "fatal to the theory of progressive development," and that:

"The entire variation from the original type which any given kind of change can produce may usually be effected in a brief period of time, after which no further deviation can be obtained by continuing to alter the circumstances the least possible excess beyond the defined limits being fatal to the existence of the individual."²

In the mid-nineteenth century Herbert Spencer was the solitary figure endeavouring to develop a serious theory of evolution, and in 1858 his views were still immature. In 1852 he stated plainly his adherence to evolutionary ideas:

"What is the most rational theory about these ten millions of species? Is it most likely that there have been ten millions of special creations? or is it most likely that by continued modifications, due to change of circumstances, ten millions of varieties have been produced, as varieties are being produced still? The supporters of the Development Hypothesis can show that the process of modification has effected, and is effecting, decided changes in all organisms subject to modifying influences They can show that in successive generations these changes continue, until ultimately the new conditions become the natural ones They can show, too, that the changes daily taking place in ourselves the development of every faculty, bodily, moral, or intellectual, according to the use made of it - are all explicable on this same principle."³

In the opinion of a contemporary observer, C. Grant Allen, this article represented the high water-mark of evolutionary thinking up to 1858.⁴ Also in 1852, in an essay on "A theory of population" in The Westminster Review,

1. Wallace, A. R.: Darwinism, p.3

2. Quoted ibid., p.4

3. "The development hypothesis," Leader, 20th March, 1852.

4. Allen, C. G.: Charles Darwin, p.86.

Spencer advanced a principle equivalent to Darwin's principle of natural selection, applied only to man:

"families and races whom this increasing difficulty of getting a living, which excess of fertility entails, does not stimulate to improvements in production are necessarily on the high road to extinction, and must ultimately be supplanted by those whom the pressure does so stimulate."¹

It was pointed out that degree of fertility is inversely proportionate to grade of development, that pressure of population is the proximate cause of progress, increasing the ability to maintain life and decreasing the ability to multiply, and that those who survive to continue the race are necessarily the select of their generation.

In 1855 Spencer published the first edition of Principles of Psychology, setting forth a developmental account of all mental process and utilizing Lamarck's explanatory principle of the inheritance of acquired modifications. The work was revolutionary in psychology, but at the time made no general impact.² Spencer himself wrote that it received only unfavourable criticisms except from G. H. Lewes³ and J. D. Morell.^{4,5}

T. H. Huxley⁶ claimed with regard to the state of evolutionary theory between 1851 and 1858 that within the ranks of biologists he knew of nobody except Grant who supported the principle of evolution, and Grant's "advocacy was not calculated to advance the cause." Outside the biologists, the only

1. Quoted ibid., p.84.

2. This opinion is supported by that of an anonymous observer writing on "The development of psychology," in The Westminster Review, 1874, vol. xlv (new series), Article 6, p.400; and by a later historian of psychology, E. G. Boring, in A History of Experimental Psychology, 2nd edn., p.240.

3. GEORGE HENRY LEWES - Physiologist and philosopher, 1817-1878.

4. J. D. MORELL - Philosopher.

5. Spencer, H.: Autobiography, vol. 1, p.468.

6. HUXLEY, T. H. - Biologist, 1825-1895.

supporter of evolutionary concepts he considered reputable was Herbert Spencer.¹

Another contemporary observer, John Fiske, asserted that:

"Before the publication of The Origin of Species there was no opinion whatever current regarding the subject that deserved to be called a scientific hypothesis."²

Assessed against a historical background of evolution theory, Darwin's contribution appears to have been, firstly, a presentation of ample and thorough observational evidence for the hypothesis of descent with modification of all species from a few ancestral forms. Secondly, he offered publicly an explanatory general theory of the means whereby this modification takes place, untrammelled by any metaphysical or pseudo-scientific propositions as to the nature of "Life," or hypostatizations of forces of "Progress." Thirdly, he published in a form calculated to appeal to both the scientist and the general reader, and pressed the message home in book after book.

Difficulties remained for Darwin's theory, certainly. There were the usual problems of interpretation: Darwin complained that natural selection was supposed by some to be an active power or deity, or to imply conscious choice in the animals which became modified, inducing variability instead of merely preserving it.¹ Specific pieces of data existed which seemed to contradict the theory, such as the infertility of hybrids and the highly-developed instincts of the neuter social insects, and a host of palaeontological material combined with lack of evidence of intermediate forms. As formulated by Darwin the theory was not a quantitative one, and not intended to make predictions - but critics insisted on turning it to this purpose. The major difficulty, however, was the absence of a reliable theory of the mechanism of inheritance, and of adequate observation of the facts of inheritance.

1. V. Poulton, E. B.: Charles Darwin and the Theory of Natural Selection, p.147.

Despite these problems, Darwin's theory met with immediate acceptance in the English scientific world. (It must be remembered that, on Darwin's own terms, such acceptance did not require recognition of natural selection as the sole mechanism of the modification of species.) An examination of the British periodical press between 1859 and 1872 conducted by Alvar Ellegard found by 1869 no arguments on a scientific level counter to the theory of descent.¹ At this stage, Darwin had not applied his theory to the human species or to mental faculties.

1. Ellegard, A.: Darwin and the General Reader, 1958, pp.51-6.

THE SITUATION OF PSYCHOLOGY

ASSOCIATIONISM

The dominant school in English psychology from the first half of the eighteenth century and in Scottish psychology from the early nineteenth century, was associationist, concerned with analysis of phenomena mainly of the intellect. The principle of association was a mechanical one, used to explain the adherence of ideas or sensation, and to account for the development of complex mental states. "On this theory, causation and composition coincide," according to G. F. Stout.¹ The idea, or image, was treated as a mental unit, the fundamental content of mind, which could be analysed into its component ideas.

John Locke (1632-1704) first introduced the notion of association; he traced two sources of ideas, sensation and reflection (the internal sense), and identified two varieties of idea, the simple and the complex. Complex ideas are compounded out of simple, by a process of association, which process also explains the successive combination of ideas. George Berkeley (1685-1753) used the principle of association to explain facts of visual space perception. David Hume (1711-1776) traced all ideas back to the materials of sensory experience; complex ideas are the result of an attraction between ideas, or association. Association was made a fundamental law within a formal doctrine by David Hartley (1705-1757), who was led to this general application by a work of John Gay. Hartley's mechanistic explanation of mind was elaborated in his Observations on Man, his Frame, his Duty, and his Expectations, published in 1748, where he developed a psychophysical system, in which the psychological association of ideas parallels the physiological vibrations resulting from sensation. The impressions made on the body by external objects were supposed to give rise to vibrations of minute

1. GEORGE FREDERICK STOUT: Professor of Logic and Metaphysics at St. Andrews, Anderson Lecturer in Comparative Psychology at Aberdeen, Wilde Reader at Oxford from 1898; 1860-1944. Stout described Associationism in his Manual of Psychology, 2nd edn., p.118

medullary particles in the nervous substance, resulting in sensations.

Diminutive vibrations, or vibratiuncles, are aroused in the brain by frequent repetition of vibrations which travel there along the nerves, "for the aether residing in the medullary substance will suffer the excited vibrations to run freely through it."¹ Vibratiuncles being the physiological accompaniment of ideas, sensations beget ideas. Association, by simple contiguity and repetition, operates both in the realm of sensations and ideas, and of vibrations and vibratiuncles. A sensation (or vibration) associated frequently with others will, when occurring alone, excite in the mind ideas (or in the brain vibratiuncles) of its associates. Simple ideas may run into complex ones, by means of association; at the same time the miniature vibrations form complex systems.

The Scottish school of psychology was less rigorously analytical than the English. Thomas Reid (1710-1796) simply listed the intellectual and active powers of human understanding which he proposed to discuss; his ultimate intention was to demonstrate the existence of unanalysable mental powers. He saw an invariable, but not, like Hartley, a necessary connection between mental and physical processes:

"Who knows but their connection may be arbitrary, and owing to the will of our Maker?"²

Reid raised the problem of how sensations become transformed into perceptions, but did not resort to association for an explanation. His approach was faithfully followed by Dugald Stewart (1753-1828), whose mental analysis consisted simply in the identification of a number of faculties and instincts. Stewart's attempts to use methods of natural science on material which he nonetheless considered to be essentially unique resulted in a superficial descriptive account of mind.

William Hamilton was the last of the pure faculty psychologists. Thomas Brown

1. Hartley, D.: Observations on Man, p.15

2. Reid, T.: Essays on the Active Powers of the Human Mind etc. p.550.

(1778-1820) adopted the Scottish view that mind is substantially an unanalysable unity, but borrowed techniques and tenets from the associationists. In Brown's terms, mental life consists not merely of a conglomeration of sensory data, but is characterized by the capacity to grasp relations.

The publication in 1829 of the Analysis of the Phenomena of the Human Mind by James Mill marked the climax of British Associationism. Mill unequivocally reduced mental life to elementary particles, passively associated by contiguity. Unlike Hartley, he did not encumber his theory with any hypothesis as to the physical mechanism of sensation and thought, though like Hartley he treated sensations and ideas as the basic elements of mind. Ideas are just copies of sensations, and only ideas are subject to the law of association, though their association depends entirely on the actual concurrence of sensations in nature. The law of association is thus a law of nature, rather than of mind. Mill dealt with the traditional list of higher mental faculties, accounting for them all in terms of association. For example, through association a word may call up a large number of ideas, developing into a complex idea; in the process of abstract-^{a naming}ion there is a separating out of the parts of a complex idea, and of the individual parts. Abstract terms are simply the concrete terms minus connotation.¹

The associationists were able fairly competently to dissect mind into its elements. So doing necessitated a description of the process whereby these elements were compounded or combined into more complex products in the first place. As a rule, the principle of association sufficed to explain this synthesis. James Mill's description of synchronous associations, however, seemed to require a new principle; synchronous associations, said Mill, combine to form a whole that appears subjectively unanalysable. In an association, the attention might be absorbed by the consequent term to the extent that the antecedent term is

1. Mill, James: Analysis of the Phenomena of the Human Mind, 1878 edn., vol. 1, pp. 234, 298, 304.

quite forgotten. As consciousness in associationist terminology is not a special faculty, but the essence of mental facts, a forgotten term is a non-mental term.¹ John Stuart Mill (1806-1873) highlighted this inadequacy in associationism with his substitution for mental coalition of mental chemistry. In Logic, in 1843, Mill made the point that the associative whole is more than the sum of its parts:

"the simple ideas generate, rather than they compose, the complex ones."

We cannot rely on deduction from what we know of the simple elements to predict the laws of the compound, but must observe the compound itself.

Before 1858, then, pure associationist psychology was weakened from within. The area of this weakness was the very one spotlighted by those who extended Darwin's theory of evolution to human mental process - the development of complex from simple forms of mind. Whereas the Associationists concerned themselves only with such development in the individual, the Darwinians included racial development and phylogenetic origin as well - but this broadening of the field of enquiry is a different matter.

Other areas emphasized by psychologists in the later nineteenth century were barely touched upon by these early writers. Except by James Mill, the affective phenomena were neglected; Darwin in 1871 included these among the mental powers of man. James Mill did not even mention instincts (described by Darwin as "mental actions."),² though the role of instinct in human conduct had

-
1. In 1818 Dugald Stewart suggested that in consequence of the habitual association of ideas, different steps of a process might present themselves to thought without our recollection of them, "so as to save us entirely the trouble of hesitation and reflexion." (Stewart, D.: Elements of Philosophy, p.109)
 2. According to James Mill, association can explain all the "active powers," which are really quite passive. Thus Motive results when the idea of Pleasure is associated with an action of one's own as the cause; Will is the same process followed by action. Any power we have over our muscular action derives from power over our associations, which "means nothing more than the power of certain interesting Ideas, originating in interesting sensations, and formed into strength by association." (Mill, J.: op. cit., vol. 2, pp.258, 328, 379)

been recognised long before. Hutcheson (1694-1747) declared that the ends of human action are determined unconsciously by instinct, and the means by reason. Thomas Reid pointed to instincts as the active powers which man has in common with the brutes, which "nature seems to have planted and reared, so as to have left nothing to human industry," and which are necessary to the preservation of the individual or of the race. Instincts appear first in the course of individual development, and the later operations of reason are influenced by them. Their primary usefulness comes when we are ignorant of the means of self-preservation, or when the conscious intention of an action would occupy too much space or time in our thoughts.¹ Dugald Stewart instanced some of the results of instinct; the development of human society, according to him, is determined solely by an innate instinct to that end, and not by "the wants and necessities of man's animal being."² It was not until the 1850's, however, that any detailed consideration was given to unconscious mental processes at all.

The mental processes of animals received attention only to illustrate the enormous superiority of the human mind. Hume described a process of

"experimental reasoning, which we possess in common with beasts, and on which the whole conduct of life depends, (which) is nothing but a species of instinct or mechanical power, that acts in us unknown to ourselves, and in its chief operations is not directed by any such relations or comparison of ideas, as are the proper objects of our intellectual faculties."³

While beasts can reason or infer from experience, they are incapable of generalizing in the abstract. Hartley considered that his theory of vibration and association applied equally to animals with man; the inferior mental capacity of animals results from the smaller amount in proportion to body size of their brain matter and its imperfect ability to retain and combine vibrations, from their exposure to different sensations, from their lack of words and the presence

1. Reid, T.: Essays on the Active Powers, etc., pp.401,146.

2. V. Warden, C. J.: "The historical development of comparative psychology," Psychol. Rev., vol.34, 1927, p.144

3. Quoted Drever, J.: Instinct in Man, p.43

of instinctive powers in their constitutions. Whereas men reason, animals have innate miniature vibrations promoting instinctive behaviour. Although Hartley identified a distinct qualitative difference between man and beast, the disparity was not great:

"the trains of ideal vibrations in their brains bear a general resemblance to the corresponding ones in ours, spring from like causes, and produce like effects Many of them have most of the universal passions in some imperfect degree, and there is, perhaps, no passion belonging to human nature, which may not be found in some brute creature to a considerable degree."¹

Thomas Reid found a qualitative difference between man and animals in the realm of intellectual as well as of active powers. In the realm of the active powers, animal behaviour is determined solely by impulse, human behaviour by impulse governed by a sense of duty. In the intellectual sphere, animals display behaviour that is apparently rational, but in fact is not - although they may hold beliefs.² Stewart drew a similar distinction between man and beast, and also attributed an important role to language in the development of the reasoning faculties:

"If man had been destined for no other purposes, than to acquire such an acquaintance with the course of nature, as is necessary for the preservation of his animal existence, he might have fulfilled all the ends of his being without the use of language."³

James Mill expanded this conception of the function of language; it enables communication and thus social co-operation:

"Almost all the advantages, which man possesses above the inferior animals, arise from his power of acting in combination with his fellows."⁴

Language gives the power of anticipating the future from the past, and thus

1. Hartley: op. cit., p.260

2. Reid, T.: op. cit., pp.78, 149.

3. Stewart, D.: Elements of the Philosophy of the Human Mind, vol. 1, p.169. 206

4. Mill, James: op. cit., vol. 1, p.128.

supplies a principle of action other than physical impulse.¹

Comparative anatomy and physiology flourished in the first half of the nineteenth century. The study of this area aroused in at least one of its exponents, William Lawrence, a firm belief in the continuity, physical and mental, of man with the lower animals. In his published lectures (of 1816 and 1819), Lawrence attempted to trace the development of each bodily organ of man through the whole series of living beings. He pointed to the dependence of mind on bodily organization, to the increase as we ascend up the phylogenetic order of sensation and emotion, and to the diversification of cerebral function. Mental manifestations were identified with brain function,² so that differences in intellect corresponded to the degree of brain development. Animals were said to show clear indications of reasoning, so that if we argue that the human mind requires any immaterial principle added to brain process, we must allow this to animals as well.³

Lawrence applied his arguments to the different mental performances of human races, and to insanity, both being explained by differences or deformity of brain structure. Psychologists before him took as their subject only the mind of the normal, civilized, contemporary adult. Reid referred to the range of human moral and intellectual endowments which "fills up all that gap which we conceive to be between brutes and devils below, and the celestial orders above,"⁴ but did not discuss it. Thomas Brown drew up a set of secondary laws of association to include in the associationist scheme the factor of constitutional

1. We can control the order of our ideas by controlling the order of our sensations, which we do by making use of a number of sensible objects as marks of our ideas - thus "we can ensure any succession which we please of the sensible objects; and, by the association between them and the ideas, a corresponding succession of the ideas." (*ibid.*, pp.131-2)

2. Lawrence, W.: An Introduction to Comparative Anatomy and Physiology, etc., pp.104, 109.

3. *ibid.*, p.116.

4. Reid, T.: on. cit., p.401.

differences between individuals which were thought to modify the primary laws.

But the only extensive treatment of individual differences was in a field quite outside orthodox psychology, and founded outside Britain -- phrenology. About 1800 Gall¹ in Germany borrowed from Reid's and Stewart's lists of mental powers thirty-seven faculties which he localized in different areas in the brain. Excess in any function, which was inheritable, was supposed to result in enlargement of the brain in the corresponding area, and to be measurable by a consequent bulge in the skull. The theory was published in detail between 1810 and 1819 in collaboration with Spurzheim,² and had immense popular appeal. In Scotland it was expanded by George Combe,³ who applied it also to animals, whose powers he supposed to be fewer in number than man's. The system otherwise received virtually no scientific support, despite the relevance of some of its implications for physiology. In 1885 the physiologist H. C. Bastian summarized the objections:

"It was altogether defective in its psychological analysis, eminently unsatisfactory in its localizations, and was, in short, as unreliable in its methods as it was inconclusive in its results."⁴

At first phrenology was rejected unequivocally by psychologists, such as Brown and Hamilton. But in a Biographical History of Philosophy in 1845, G. H. Lewes⁵ praised the contribution of the phrenologists in bringing out the innate character of fundamental human tendencies, the independence of various faculties, the error involved in isolating man from the animals, the need for biological methods in psychology, and for the establishment of a precise relationship between the physical and moral natures.⁶ In 1861 Alexander Bain⁷ ascribed his interest in the analytical study of human character to phrenology. Phrenology, he claimed, "has done good service, by showing with more emphasis than had ever before been

1. GALL, F. J., Anatomist, 1758-1823.

2. SPURZHEIM, G., 1778-1832.

3. COMBE, G., 1788-1858.

4. Bastian, H. C.: The Brain as an Organ of Mind, p.520.

5. LEWES, GEORGE HENRY, Physiologist and Philosopher, 1817-1878.

6. Quoted Ribot, T.: English Psychology., pp.285-6.

7. BAIN, ALEXANDER, Professor of Logic at University of Aberdeen, 1818-1903.

done, that human beings are widely different in their mental tastes and aptitudes."¹ Although Bain was well aware of the shortcomings of the phrenological system, he considered it had transformed the convenient neglect of the existence of character differences into a scientific study of the same.

PSYCHOLOGY OF THE 1850'S

The major works on psychology in the 1850's were unquestionably those of Alexander Bain and Herbert Spencer; their contributions will be considered in detail. Other writers who concerned themselves in one way or another with human mental process were the physiologists W. B. Carpenter and G. H. Lewes, the philosopher J. D. Morell, the physician Daniel Noble, and Sir Benjamin C. Brodie. All emphasized the close relationship between bodily and mental processes, and some explored this area in detail. All but Bain expressed their belief in the principle of continuity of species.

In Principles of Comparative Physiology (1854), Carpenter traced the progressive structural complication through the animal series of the nervous system, from a basis of "unconscious" reflex action. The corresponding development of the functions of the nervous system, which "serves as an instrument of psychical powers," was also briefly discussed.² The main pattern identified was the gradual subordination to the Intellect and Will of automatic movements, of which the purpose in man is limited to the maintenance of the organic functions, "in subservience to the more elevated purposes of his existence."³ These automatic or instinctive actions were defined as being performed in immediate response to certain sensations, with no intentional adaptation of means to ends on the part of the individual. Carpenter made an attempt at localization of the functions of the nervous system, by comparing its structure in species with different behaviour processes.

1. Bain, A.: On the Study of Character, including an Estimate of Phrenology, Preface.

2. Carpenter, W. B.: Principles of Comparative Physiology, ch. 13.

3. *ibid.* p. 650.

In his Psychological Inquiries: in a series of essays intended to illustrate the mutual relations of the physical organization and the mental faculties (of which the third edition appeared in 1856), Benjamin Brodie briefly performed a similar task. Mentioning the development through different species of brain structures, he tried to localize specific functions by quoting evidence from comparative anatomy. Brodie, however, made no attempt to trace the development of function; this was said to be foreordained by the Creator, and to be independent of the development of the brain. Mental principles of man and animals were nonetheless supposed to be basically the same:

"I do not see how anyone, who does not (with Descartes) believe animals to be mere unconscious machines, can arrive at any other conclusion."¹

A certain amount of anecdotal evidence was advanced to substantiate the existence in dogs of the powers of reasoning and abstraction. Like Carpenter, Brodie suggested that the difference between the human and the animal mind depends chiefly on the relative proportions in them of intelligence and instinct.

Daniel Noble in 1853 advanced the same argument:

"When we come to the mammalia, and progressively ascend the scale, we find the entire conscious life of the different creatures becoming less and less a mere sensibility, and more and more an intelligence. And when we arrive at man, the highest forms of this latter are attained."

The lower we go,

"the more do the actions appear to spring from some instinctive, unintelligent source - most likely emotional sensibility."²

Varying states of consciousness such as hope, fear, grief and so on are just modifications of emotional sensibility. Noble firmly localized mental functions in the nervous system - reflex movements in the grey matter of the spinal cord and the sympathetic ganglia, consensual actions in the sensory ganglia, emotional movements and expressions in the optic thalami and corpora striata, intelligence in the hemispherical ganglia - while voluntary acts proceed from the MAN.³ He

1. Brodie, B. C.: Psychological Inquiries, 3rd edn., Preface.

2. Noble, D.: Psychological Medicine, pp.34-5.

3. ibid., p.63.

considered brain process to be subservient to the operations of mind; Carpenter implied the reverse, while Brodie's system was based on the notion of parallelism. Insanity, however, consists in "apyrexial disorder of the brain, perverting thought or feeling, to the destruction or impairment of moral liberty,"¹ which results from a predisposition, probably inherited in the individual though perhaps acquired by a forbear, and an exciting cause.

In these writings of physiologists and physicians were definite beginnings of a comparative psychology. Carpenter even uttered a warning as to the difficulties of the subject:

"It is impossible to say, in regard to many of the actions of the lower animals, to what extent they involve feelings or emotions at all analogous to those which we experience."²

The notion of mental development through species was clearly present in their work, although the only explanation of such development was advanced by Brodie, in terms of foreordination by the Creator. In 1859 G. H. Lewes hinted at another explanation, consequent upon some research published by him in 1858, and independent of Darwin's contribution;³ the unity of consciousness can be deduced from the fundamental unity in substance and property of the nervous system throughout the animal kingdom.

"Simple as the forms of consciousness may be in the lower animals, it must nevertheless be essentially akin to the more complex forms in the higher animals."⁴

Whereas Lewes treated consciousness as a function of the organism, Carpenter treated the nervous system as the instrument of mind; Carpenter was not then logically bound to the belief that consciousness develops no faster than its means of operation, but in fact proceeded as if it depended on their development for its own.

1. ibid., p.2.

2. Carpenter, W. B.: op. cit., p.649.

3. Lewes, G. H.: "The spinal chord a sensational and volitional centre," Report of Br. Asscn., 1858, pp.135-8.

4. Lewes, G. H.: The Physiology of Common Life, p.75.

In 1853 a hypothesis was advanced as to the cause of development throughout the animal kingdom by a philosopher, J. D. Morell. Morell himself declared his postulate to be nothing more than an empirical description; to psychology he gave the status of a natural science investigating the essential properties of the human mind and resting on a basis of physiological knowledge. The continuity and development of mental life from the lowest to the highest organic forms was ascribed to principles of universal reason and progress:

"The laws of reason pervade the entire realms of existence an unbroken series of ascending phenomena is presented from the lower regions of organized forms, up to the very world of thought and feeling."¹

This series presents an ever-perfecting organization tending to an ideal, or aiming at Progress. All members of a genus are variations on the ideal type. The ideal aim of the human species, displayed in the development of the individual, is the attainment of complete freedom of action, in the form of Thought, Love and Freedom. The passage of mind through the animal series was described by Morell with brevity but without clarity. In the lower animals mind ranges from bare sensibility to unselfconscious reason. The development of the human mind was traced in more detail, especially that of the intelligent aspect² - but Intellect, Feeling and Will are basically a unity, and develop together in four main stages. These are: for Intellect - Sensation, Intuition, Representation and Reason; for Feeling - Pleasure and Pain, Sentiments, Affections, and Love; for Will - Practical Instinct, Passions, Art and Freedom.³ The Associationists before the 1850's treated only the compounding of complex aspects of mind consequent upon their analysis of it; Morell appears to have been the first to do more than just recommend the tracing of the growth and development of the individual human mind

1. Morell, J. D.: Elements of Psychology, Preface.

2. Morell intended to follow his volume on the intellectual powers with one on the feelings and the will, but only did so in an entirely new work in 1862.

3. ibid., p.65.

treated as a unity, even though his approach was based in part on a priori principles and not on a study of the maturing mind of the child. In accord with his account of mental stages as variations from an ideal, Morell drew attention to the science of Anthropology, which deals with man in all his natural variations - of race, age, sex and temperament.

Alexander Bain remained an associationist with physiological interests.

Into his observations he introduced more rigorous experimental methods than were customary among his predecessors. In the place of a simple mental associationism he elaborated a system of psycho-physical parallelism, discussing both the physical and mental aspects of every topic. His physiological borrowings were extremely comprehensive; he neglected only the recently discovered material relating abnormal to normal brain processes. On the psychological level, he surpassed the earlier associationists by covering the entire range of normal experience, instinct included.

In 1855 the first edition of The Senses and the Intellect appeared. Bain prefaced it with the announcement that he was constructing a natural history of the feelings, and proceeded to reduce mind to its primitive elements. Basic are Feelings, shared with the lower animals, and characterized as Emotion, Volition and Thought. The basis of intellect is discrimination or consciousness of change, but consciousness of agreement and retentiveness are also necessary to it; the function of intellect is the conversion of instinct into cultivated emotions and acts. "Instinct is defined as the untaught ability to perform actions of all kinds, and more especially such as are necessary or useful to the animal."¹ Instinct includes reflex acts, primitive arrangements for co-ordinated activities, connections between feeling and its expression, and the germ of volition. Bain gave a detailed account of the development of reflex action from a simple stimulus-response

1. Bain, A.: The Senses and the Intellect, 3rd edn., p.246.

connection to a self-adjusting power (as where the obtaining of food leads to a muscular movement to get more). Reflex and voluntary action have in common the fact that they are usually directed to the preservation of the individual. Volition itself is a compound, made up of spontaneous activity¹ and a learnt connection between emotional and active states. Such associative learning takes place when pleasure or pain accidentally results from spontaneous action. Proceeding with his natural history, Bain described how the three basic principles of intellect build up the intellectual powers by association.

The Emotions and the Will was first published in 1859; herein were classified and described nine irreducible emotions, on grounds of introspective reference, behaviour, and emotional expression. (A preferred basis, said Bain, would be the nature of the diffusion of physiological currents embodying the feeling, and of the organs especially aroused by it, but the data for such a procedure is inadequate.) The development of the individual human Will out of the powers of spontaneity, self-conservation and retentiveness, with its successive extension of control over the bodily organs, feelings and thoughts, was outlined. The physical basis of feelings and consciousness were discussed, and the author arrived at "the most general physical condition of consciousness."²

The stages in Bain's natural history of the human mind were determined by a consideration of physiological evidence (in these early works Bain just assumed that mental stages parallel physiological), and of the adult human mind. No attempt was made to consider the evidence of the developing mind of the child, or of adult minds in different stages of development. Nor did Bain utilize any information on the origin at different stages in the animal kingdom of different

-
1. The principle of spontaneous action was Bain's original contribution to the theory of volition, previously brushed over by most associationists. In terms of the principle, the nervous system is capable of spontaneous action in the absence of stimulation; this action involves movement which gives rise to sensation - the experiential aspect of the will.
 2. This is "an increase or diminution of the nerve-currents circulating in the interior of the brain, sufficiently diffused to affect the combined system

forms of mental process. He nowhere asserted a belief in mental continuity from the lowest to the highest forms of animal life, as did Carpenter, Brodie, Noble, Lewes and Morell, and only briefly commented that man can be usefully compared with animals in respect of movements, sensations, appetites and instincts.²

Bain's source of data on the process of human development was much more restricted than that of his contemporary, Herbert Spencer, and their bases of classification and analysis consequently differed. In a criticism of The Emotions and the Will,³ Spencer suggested Bain's classification of the emotions should have been based not only on an analysis of them and their manifestations in behaviour, but on observation of which emotions appear first in the animal kingdom, in what order the others accompany higher endowments of organization and intellect, and how they are severally related to the conditions of life. (Spencer believed that new emotions are developed by new habits of life.)

Spencer's affirmation of belief in the modification and development of species made in 1852 has already been mentioned;⁴ it carried the implication that mind as well as bodily organization has naturally evolved. During the 1850's and 1860's, Spencer conceived the plan of a system setting forth the universal presence of traits of progress in all forms of existence, inorganic, organic and super-organic (social), of which the distinguishing mark would be the passage from homogeneity to heterogeneity. His psychological contributions bore the stamp of this plan. In an article on "The art of education" in 1854, Spencer wrote of mind that:

1. (Contd. from last page) "... of outcarrying nerves." (The Emotions and the Will, 3rd edn., Appendix A).
2. Bain, A.: The Senses and the Intellect, p.57.
3. Written January 1860; published in Spencer's Essays, no. 7.
4. pp.19-20.

"like all things that develop, it progresses from the homogeneous to the heterogeneous,"

and that,

"the development of the mind, like all other development, is an advance from the indefinite to the definite."¹

In the following year, the first edition of the Principles of Psychology appeared.

Spencer, like Bain, used association as an integrating mechanism building up experience. The outlined aim for the work comprised a general and a special analysis of mind, and a general special synthesis of the relation between life and its environment. The general analysis was to ascertain the fundamental peculiarity of all modes of consciousness constituting knowledge proper. It was concluded that consciousness consists of changes combined in special ways, and that the development of consciousness is the organization of these changes. The original modifications of consciousness are centrally and peripherally initiated feelings (emotions, organic and external sensations) which can be primary or secondary (emotions and sensations proper, or fainter ideational revivals of the primary). Secondary modifications of consciousness are the relations between feelings, the relations being modes by which we are affected by the comparison of feelings³. As Boring points out,² the inclusion of these relations between feelings reduced the task of association. Association holds together both feelings and relations. Special Analysis of each species of cognition into its components displays a unity of form and process throughout all the phenomena of intelligence. Simultaneously with the first changes with which consciousness

1. Published North British Review, May 1854; quoted Spencer, H.; Autobiography, p.438.

2. Boring, E. G.; op. cit., p.240.

3. States of consciousness become elements of thought only by being known as like certain previous states, this is, by being integrated with these states. As consciousness depends on change, there must be continuous differentiation of its states. So all mental action is definable as "the continuous differentiation and integration of states of consciousness."

(Spencer, H.: Principles of Psychology,
1st edn., p.333.)

begins are given data for the relations of likeness and unlikeness - these relations then must be the foundation of our entire intelligence. An organic classification of impressions is essential to the lowest sentient beings, for:

"The condition on which every creature exists is, that it shall act in special ways under special stimuli - that contact with nutritive matter shall modify its actions in a manner different from that in which contact with innutritive matter modifies them Manifestly, if there is an entire absence of adaptation between its acts and surrounding circumstances it must quickly cease to live. And if it exhibits any adaptation, it can do so only in virtue of the fact, that certain impressions made upon it call forth one kind of action while others call forth another kind."¹

Survival, therefore, demands adaptation of the organism, achieved by organic registration of external differences and likenesses; consciousness of these is not necessary. Differences in ascending grades of intelligence result solely from the increasing complexity of the impressions assimilated. Intelligence has no distinct grades, nor is it constituted of faculties that are truly independent.

In the General Synthesis was given an abstract statement of the relation subsisting between every living organism and the external world, in terms of which relation all vital actions are expressible. This relationship is one of correspondence between simultaneous and successive changes (internal relations) and co-existences and sequences (external relations). The degree of life varies as the degree of correspondence. Mind emerges out of bodily traits and becomes distinguished from it in proportion as traits of correspondence (in Space, Time, Speciality, Generality and Complexity) between inner and outer relations become more marked.

The Special Synthesis exhibits the differentiation of psychical from physical life. Nerve fibre originates in consequence of the habitual passage of stimulus waves along a particular path in an organism which initially presented no

1. ibid., p.331.

differentiation. The path first followed becomes the line of least resistance, and is more likely to be chosen again, on the principle that motion always follows the line of least resistance. Simple reflex action, the unconscious basis of intelligence, operates by means of these nerve fibres. Variations in the kind and combination of impression become by slow degrees organically linked to different and severally appropriate motor results. As reflex action becomes more complex, nervous ganglia develop, and these direct nervous tremors into the particular channels required. Progressive complication of these centres coincides with the rise of intelligence, as the succession of changes in the ganglia implies increased experience of likenesses and differences. The extent of intelligence thus coincides with the range of neural action. The changes distinguishing intelligence are distinct from those constituting bodily life by being serial only, instead of both serial and simultaneous. The tendencies of various mental states to cohere in consciousness are in proportion to the degree of constancy of the connections between the environing phenomena they represent. Furthering of the degree of correspondence is effected by increased experience of the outer relations among phenomena in the environment; the effects of the resulting association between inner mental states last not only in the individual, but are transmitted as modifications of the nervous system. The result is evolution.

The nature and genesis of different modes of intelligence are described in terms of the relation obtaining between outer and inner phenomena. Basic is reflex action, which shows an established connection between two psychical states answering to one between two external phenomena. Out of simple reflex action comes instinct, or compound reflex action "in which a combined cluster of stimuli produce automatically a combined cluster of motions."¹ As the connected antecedents and consequents in the environment become more involved, and correspondingly

the connected clusters of internal changes answering to them do likewise, both external and internal sequences are less frequent and unvarying in character. Clusters of internal changes will begin to take place hesitatingly, and become appreciable parts of consciousness - thus conscious perception, memory and reason, emotion and will are born. Rational action first occurs when the strongest of antagonistic motor tendencies passes into action - the strongest will be the one most uniformly and frequently repeated in experience, and will thus be the best adapted to the circumstances. Brute rationality imperceptibly passes into human rationality, with increasing complexity of experience.

Thus the analysis of mind led Spencer to conclude the fundamental unity of mental process. This conclusion, and that arrived at in the General Synthesis concerning the relationship existing between life and its surroundings, were utilized to describe the development of mind in general from its simplest to its highest form. Bain, on the other hand, conducted a similar analysis, in relation however only to the human mind; to the human mind alone he applied his notions concerning mental development and the analogy of physiological process.

As well as asserting the continuity of mind, and describing the stages in its development, Spencer worked out his own theory of mental evolution. The nervous systems of offspring generations of organisms were believed to be modified by the transmission of learnt associations between phenomena in the environment from their ancestors. These inheritable modifications serve, not just as the raw material for a process such as natural selection, but as the whole means of evolution, raw materials plus process. This was the application in psychology of Lamarck's theory. Not only did Spencer emphasize the importance of the environment in moulding mental process of the individual - habitual exposure to a particular environment would modify mental process in the race.

Per Spencer the psychology of the 1850's supplied itself with an explanatory principle of the course of mental development, which course was itself already described by others. Alexander Bain remained unconvinced of the relevance of material on the genesis of mental process to human psychology, and was not interested in extending the field of psychology outside the human mind.

VERDICT OF THE ENLIGHTENED

(Darwin's contemporary supporters among psychologists were both self-conscious and voluble about the implications of his theory for their area of study. Their application of their own personal interpretations comprises the subject-matter of the ensuing chapters, but their critical discussion of Darwin's historical role may serve as a useful introduction. The discussion was, necessarily, one-sided, and is here employed just as suggestive material.)

Darwin himself gave only brief consideration to the effect his biological theory was likely to have on other areas of research. His solitary statement relating his work to the study of psychology¹ put the onus of responsibility for revolutionizing psychology onto Spencer, as having already laid the foundation "of the necessary acquirement of each mental power and capacity by gradation." Darwin's final assessment of Spencer's approach was unflattering:

"I am not conscious of having profited in my own work by Spencer's writing. His deductive manner of treating any subject is wholly opposed to my frame of mind. His conclusions never convince me His fundamental generalizations, which I daresay may be very valuable under a philosophical point of view, are of such a nature that they do not seem to me to be of any strictly scientific use. They partake more of the nature of definitions than of laws of nature. They do not aid me in predicting what will happen in any particular case."²

Spencer for his part devoted much space in his Autobiography to an attempt to establish prior claim to the doctrine of evolution. He quite admitted that he

1. Quoted p.1.

2. Autobiography of Darwin, Cambridge MSS; deleted from publication; quoted Himmelfarb, G.: Darwin and the Darwinian Revolution, pp.186-7.

had not anticipated the theory of natural selection except in a limited application to the human race. With regard to the publication of The Origin of Species, Spencer wrote:

"Up to that time, I held that the sole cause of organic evolution is the inheritance of functionally produced modifications. The Origin of Species made it clear to me that I was wrong; and that the larger part of the facts cannot be due to any such cause To have the theory of organic evolution justified was, of course, to get further support for that theory of evolution at large, with which, as we have seen, all my conceptions were bound up."¹

The earliest publication explicitly devoted to the topic of the bearing of evolutionary theory upon psychology was an essay published in 1874 by James Sully² on "The Relation of the Evolution Hypothesis to Human Psychology."³ The hypothesis was attributed jointly to Darwin and Spencer; the situation was summarized in two propositions. Firstly, the Evolution Hypothesis leads one to view all successive manifestations of the individual mind as being continuous with the race as much as with the individual; secondly, it eliminates the subjective methodology from a large part of the now expanded field of psychology - the study of animal mentality. These contributions from evolutionary theory Sully was in 1874 prepared to forego. Psychology, he maintained, should consist of an abstract area, composed of classification of mental phenomena and formulation of laws, and a concrete one, consisting in discussion of the growth of specific varieties of idea and emotion in different environments and temperaments. These areas would supply sufficient material for psychology without the inclusion of animals, of whose minds we can never have direct knowledge - and a direct approach is best suited to the peculiar subject matter of psychology (a somewhat peculiar line of reasoning). Mental phenomena can be adequately explained by the recurring impressions of individual experience, superadded to the data of a definite

1. Quoted in Tax, S.: Evolution after Darwin, vol. 2, p.206, by H. W. Morgan.

2. SULLY, JAMES: 1842-1923, Grote Professor of Mind and Logic at London Univ. from 1892.

3. Published in Essays on Sensation and Intuition by Sully (No. 1).

nervous organism with special susceptibilities in various sensory nerves and a few ascertained instinctive tendencies.

This article of Sully was as much propaganda for his own preferences as academic discussion of the situation. While he showed himself prepared to accept the implications of evolutionary theory applied to mind, he would not include in his field of study the additional data it offered or the new area of research it opened. Yet he made it clear that others were already doing so. Sully did include in the field a consideration of human individual differences, and of the question of the transmission through generations of acquired mental characteristics.

Later converts of Darwin did not thus limit the scope of psychology, and so magnified the impact upon it of Darwin's ideas. Mainly, they emphasized his influence in opening the areas of comparative and genetic psychology, which they admitted into the field of their subject despite peculiar difficulties of these areas.¹ W. M. McDougall² typified their attitude:

"It is only a comparative and evolutionary psychology that can provide the needed basis; and this could not be created before the work of Darwin had convinced men of the continuity of human with animal evolution as regards all bodily characters, and had prepared the way for the quickly following recognition of the similar continuity of man's mental evolution with that of the animal world."³

Different aspects of Darwin's influence were highlighted by different individuals. James Ward⁴ stressed that the emphasis in comparative and genetic psychology was on "will, and not intellect, activity and not sensitivity."⁵ The functions of perception and intellect were then "to guide action and subserve volition." G. J. Romanes⁶ gave high praise to Darwin's own individual contribution

-
1. See for instance: Romanes, G. J.: "Work in psychology," in Charles Darwin - Memorial Notices reprinted from NATURE, 1882; Morgan, C. L.: "Mental factors in evolution," in Seward, A. C., ed.: Darwin and Modern Science, 1909; Ward, J.: "On the definition of psychology," Br. J. Psychol., vol.1, 1904-5.
 2. McDougall, WILLIAM M.: 1871-1938, Physician, Reader at University College, London, and second Wild Reader at Oxford, 1904-1920.
 3. McDougall, W. M.: Introduction to Social Psychology, pp.4-5.

(Over)

to psychology - the chapter on instinct in The Origin of Species, the sections in The Descent of Man on human mental powers, and the volume on The Expression of the Emotions.⁷ In the opinion of C. L. Morgan, mental evolution for followers of Darwin in 1909 was still in a measure subservient to organic evolution.

"Intelligence has contributed to evolution of which it is in a sense a product."

Consciousness appears afresh in each generation;

"only insofar as change in organic structures are transmitted through heredity, is mental evolution rendered possible."⁸

So psychologists were led to seek in physiology a basis for their science. For purposes of exposition they needed to treat mental processes as just:

"one mode of expression of the same changes of which the physiological processes accompanying behaviour are another mode of expression,"⁹

and thus subject to natural selection in the same way. The task of comparative and genetic psychology, in the light of Darwinism interpreted by Morgan, was "the full working out of the delicate and subtle relationship of instinct and educability."¹⁰ Darwin's treatment of instinct was predominantly biological, in the sense of an inheritable complex of anatomical and physiological conditions under which, in appropriate circumstances, the organism so behaves. Psychologists then, thought Morgan, should use the term "instinctive" to comprise all congenital changes of behaviour which contribute to experience.¹¹

These writers within the period under discussion were able to point to areas where the influence of evolutionary theory was most conspicuous, and to modes of its application. All these historians and critics however omitted to consider any possible relationship between the theory of natural selection and the increasing study of individual differences.

(4. WARD, JAMES: 1843-1925, Fellow at Trinity College from 1875.
Contd. from over (5. Ward, J.: op. cit., pp.20-1.

(6. ROMANES, GEORGE JOHN: 1848-1894, Zoologist.

7. Romanes, G. J.: op. cit.,

8,9,10,11. Morgan, C. L.: op. cit., pp.425, 426, 435, 442, 430.

12. MORGAN, CONNY LLOYD: 1852-1936, Professor of Psychology and Education at Bristol.

IMPLICATIONS

The Status of Higher Mental Processes
Mind and Body
A Science of Behaviour
"Darwin versus Lamarck"

PROPAGATION

APPLICATIONS

The Course of Mental Development

Observable Stages in Mental Development

MENTAL EVOLUTION

IMPLICATIONS

The fact of mental evolution was not universally recognised as a necessary corollary of the theory of organic evolution - nor did Darwin establish it. He simply applied his theory of the modification of species to all mental phenomena treated as functions of the organism, and attempted to show that it offered an adequate explanation of their origin and development. As mental phenomena were treated in a section of their own, this functional approach was not particularly apparent or consistent. Darwin was not concerned with the question of the ultimate origin of mind. Few of his contemporaries, however, were prepared to accept behaviour of the organism as the primary data of psychology, and the crucial question of the nature of the relationship between body and mind was still being actively debated on a metaphysical level. Details of Darwin's account of mental development were questioned for various reasons; by some it was argued that his explanatory principles were insufficient or wrongly applied, and by others that the higher mental processes are not susceptible of any explanation in terms of natural law.

A chronological and critical account of the history of mental evolution theory will be given in the following sections. In the next subsections will be considered the history of the objections just mentioned; these were based on grounds either outside psychology altogether, or outside the immediate problem of mental evolution.

THE STATUS OF HIGHER MENTAL PROCESSES

The argument that the higher mental processes are unique in character was advanced by very few of Darwin's scientific colleagues against any theory of

mental evolution. For those not critically-minded, the problem could be easily solved in terms of personal pre-conception. So Henry Calderwood, a clergyman writing on The Relations of Mind and Brain (1879) and Evolution and Man's Place in Nature (1896), was able dogmatically to state that Man was more than Animal, which lacks the power of reason, and that the development of the human brain has been determined by Mind as well as by Evolution. A psychology struggling to become a science could hardly afford to make similar admissions. Neither of the two leading dissenters in Britain to a thorough-going mental evolution were primarily psychologists, and their supporting evidence was quite dissimilar. St. George Mivart emphasized the vast difference existing between the mind of the ape and that of the lowest savage, which, he argued, was only manifested in the brutes' lack of speech. Thought generates words, not the reverse; as animals cannot conceptualize, reason could never have sprung from their purely sensuous language.¹ A. R. Wallace, on the other hand, considered the difference in intelligence between the minds of the savage and the ape to be so slight as not to account for the much larger brain of the former on grounds of natural selection alone. Natural selection does of course operate on mental characteristics, to the extent that it even ceases to operate on physical features, and encourages the formation of societies. But certain intellectual, moral and spiritual faculties (mathematical, musical and artistic, as well as wit and humour) are of no assistance in survival. These

"clearly point to the existence in man of something which he has not derived from his animal progenitors -- something which we may best refer to as being of a spiritual essence or nature, capable of progressive development under favourable conditions."²

Nonetheless, Wallace was prepared to agree that mental process appears continuous in character in all forms of animal life. In his restricted application of the

1. Mivart, St. G.: "Intellect and Evolution," Br. Quart. Rev., 1881, pp.298-333.
2. Wallace, A. R.: Darwinism, p.474.

principle of natural selection, Wallace won an Irish disciple in J. J. Murphy, who argued that:

"In all mental intelligence, as in organizing intelligence, there is an element not derived from habit and not resolvable into any unintelligent force whatever."¹

Murphy attributed the beginnings of life to a Creative Power, which, once man's bodily and instinctive powers were fully developed, added as well a touch of spirit.

No explicit avowals of similar belief have been located in other psychological writings in the fifty years after 1858.

THE RELATION OF BODY AND MIND

Acceptance of a theory of organic evolution made vital for an attitude to mental evolution the question of the relationship between physical and mental process. It was clear that an evolution of the individual consciousness takes place anew in each generation, and that consciousness must somehow rely on organic structure for hereditary transmission. Advances in physiological knowledge made the close relationship between physical and mental process apparent to all, but did not resolve the question of the nature of this relationship - whether it was causal, and if so in which direction, or correlational. Darwin seemed to give causal priority to organic factors; mental processes for him are the accompaniments of functional activities of physical structures, so that mental evolution inevitably accompanies physical. Never prevalent was the view that organic development is subsequent to that of mental, though those who believed in the inheritance of acquired characteristics made structural modifications depend at least partly on functional change. Daniel Noble in 1855 had argued² that the coincidence of modifications in the brain and higher parts of the nervous system indicated the subservience of these organs to the operations

1. Murphy, J. J.: Habit and Intelligence, Preface.

2. v. pp.32-3.

of mind. In 1874, W. B. Carpenter in Principles of Mental Physiology defined two basic doctrines: the dependence of the automatic activity of the mind upon conditions which bring it within the nexus of physical causation, and the existence of an independent power controlling and directing the activity of the Will.

Such views were definitely in a dwindling minority. Fashionable rather were variations on the psychophysical parallelism enunciated by Bain in 1855 and 1859. In 1874 Bain gave his attitude more explicit formulation: in Mind and Body: the theories of their relation, he developed the idea of the physical side of existence as a closed causal system with cause and effect quantitatively equal in terms of energy, and of the mental side paralleling it without equivalence.

"The one substance, with two sets of properties and two sides, the physical and the mental - a double-faced unity - would appear to comply with all the exigencies of the case."¹

C. L. Morgan rejected any analogy from physics, but adopted a view for all practical purposes indistinguishable from Bain's - the so-called double aspects view:

"The so-called connection is, in reality, as I believe, identity. Viewed from without, we have a series of physical and physiological phenomena; felt from within, we have a series of mental and psychological phenomena."²

He realized that:

"on the hypothesis of scientific monism here adopted, ... we are logically bound to regard psychological evolution as strictly co-ordinated with biological evolution."³

He found it necessary to include mental evolution in a "metakinetic" evolution, paralleling kinetic or physical evolution. The only metakinesis we know directly is our own consciousness, but on the hypothesis of monism there must be metakinetic parallels to all stages of organic development. Even with infra-neural modes of

1. Bain, A.: Mind and Body, p.196.

2. Morgan, C. L.: Animal Life and Intelligence, p.417.

3. Morgan, C. L.: Introduction to Comparative Psychology, p.36.

energy there must be infra-consciousness. Further,

"Metakineses are determined by other metakineses, and by them alone."¹

Morgan's argument was widely adopted on both sophisticated and unsophisticated levels. On an unsophisticated level, H. R. Marshall decided that all elementary activities of life have psychic correspondents which become conscious when a part of physical action stands out. Thus "Variation from typical biological forms involves necessarily variation from typical psychological forms."² More subtle was the argument of G. H. Lewes, whose adoption of the interpretation of physical process as just the objective aspect of mental, and mental process as the subjective aspect of physical,³ coincided with his conclusions from physiology, which led him to view sentience as a property of the whole organism, and not of particular structures. Such a notion was highly compatible with a theory of evolution of mental properties inherent in any living organism by progressive differentiation of structure. In the subjective aspect, declared Lewes, consciousness is as much an agent as a change in the organism viewed objectively.

This approach was not without its critics. D. A. Spalding, reviewing Lewes's The Physical Basis of Mind,⁴ attacked the interpretation of consciousness as an agent as being either tautology or nonsense. More numerous, however, were those who found the approach serviceable. G. J. Romanes expressed his agreement with Lewes on this matter of aspects:

"If we suppose that Force and Feeling are everywhere one we have a logically possible theory which does not labour under any of the logical disadvantages attending the theory of causality proceeding from matter in motion to mind, or vice versa."⁵

J. D. Morell simply declared his approach monistic, and proceeded from there.⁶

1. Morgan, C. L.: Animal Life and Intelligence, pp.477-481.

2. Marshall, H. R.: "Consciousness and biological evolution," Mind, 1896, pp.369-73.

3. Lewes, G. H.: The Physical Basis of Mind, Preface.

4. In Nature, vol. 6, no.405, 2/8/77, pp.261-2.

5. Romanes, G. J.: Review of Stewart Duncan's "Conscious Matter," in Nature, vol.23, No. 598, 14/4/81, pp.553-4.

6. Morell, J. D.: An Introduction to Mental Philosophy, p.7.

G. F. Stout¹ likewise adopted a hypothesis of psycho-physical parallelism.² Although material phenomena determine the brain-processes correlated with consciousness, they need not, he considered, determine consciousness itself.

Henry Maudsley³ argued from the conception of mind and brain as the same substance (mind being the symbol by which such substance is denoted through consciousness and brain the symbol by which it is denoted through the senses), that it is more satisfactory to reject unreliable introspective techniques and to study mind by means of physiology alone. Mental evolution would thus have to be treated as being dependent on organic.

In the published Lectures and Essays (1879) of W. K. Clifford,⁴ the combining influences of the notion of psycho-physical parallelism, the evidence of the close relationship between physical and mental process, and the theory of organic evolution, were quite plain, and led inevitably to the conclusion of mental evolution. Clifford wrote:

"Seeing that in its continual changes and in the preservation of the records of these changes every organism resembles the mind, so that to this extent they belong to the same order of phenomena, may we not reasonably suppose that the laws of change are alike, if not identical, in the two cases? We find, when we attempt to enter into (the consciousness of the higher animals), and to judge by their actions what sort of consciousness they possess, that it differs from our own in precisely the same way that their brains differ from our brains We are obliged to assume, in order to save continuity in our belief, that along with every motion of matter, whether organic or inorganic, there is some fact which corresponds to the mental fact in ourselves."⁵

Whether psycho-physical parallelism became fashionable because it fitted in with a preconception in favour of a self-regulating mental evolution, or whether, popular for independent reasons, it helped foster the notion of mental evolution,

1. STOUT, G. F.: 1860-1944, Anderson Lecturer in Comparative Psychology at Aberdeen 1896, Wilde Reader at Oxford 1898-1904, later Professor of Logic and Metaphysics at St. Andrew's.

2. Stout, G. F.: Groundwork of Psychology, p.27.

3. MAUDSLEY, HENRY: 1835-1918, Physician.

4. CLIFFORD, W. K.: Professor of Applied Mathematics and Mechanics in University College, London.

5. Clifford, W. K.: Lectures and Essays, vol. 1, p.83, vol. 2, pp.60-1.

is a question which could only be settled by the case-histories of its exponents. It is certain that such ideas existed quite apart from any idea of mental evolution, and before publication of Darwin's theory of organic evolution, in the writings of Alexander Bain. It is also clear that physiological discoveries were making some such theory necessary.¹ But it is quite possible that the theory was boosted in popularity by being convenient as an argument for mental evolution.

A system of psycho-physical parallelism, based on a monistic belief, was not an essential requirement for exponents of mental evolution. Herbert Spencer's description of the development of life as depending on a correspondence between inner relations and progressively complicating outer relations, presupposed a dualism of being:

"there is necessarily implied by the theory of Evolution, a mode of being independent of, and antecedent to, the mode of being we not call consciousness."²

Adoption of some of Spencer's arguments based on the theory of correspondence did not necessarily imply an acceptance of the dualist to all who did so.

G. L. Morgan, whose outlook was unequivocally monistic, nonetheless agreed with Spencer that the more complex and variable the environment, the less definition there is in inherited modes of response.

W. M. McDougall, likewise an upholder of the doctrine of mental evolution, developed a system of interactionism, in which physical and psychical processes mutually affect each other. This outlook resulted in his reverting to a position similar to that of Darwin, taking as his data for psychology the facts of behaviour - for all experience, he thought, affects behaviour.⁴

1. Cf. Ch. 5.

3. Spencer, H.: "Professor Green's Explanations," Contemp. Rev., vol.39, 2/81, p.306.

4. McDougall, W. M.: Physiological Psychology, p.2.

A SCIENCE OF BEHAVIOUR

Advantages of treating psychology as "the positive science of conduct or Behaviour" were pointed out by McDougall to be the inclusion thereby of unconscious mental factors, and the facilitation of the study of animal psychology. General psychology "must take the largest possible view of its scope and functions, and must be an evolutionary natural history of the mind."¹ Darwin found behavioral manifestation the best basis of comparison of human and animal mental processes, and all comparative psychologists after him realized they could only infer mental processes from the behaviour of creatures without language. This necessity for inference was particularly obvious in the study of other cultures and of the insane. Yet emphasis was slow to shift from the mental processes to behaviour. Even in 1906, in An Introduction to Comparative Psychology (second edition), Morgan defined the subject-matter of psychology as "states of consciousness," while conceding that:

"Inasmuch as these psychical states are associated with a physical organism, comparative psychology must pay attention to the nature and conditions of the association."²

G. F. Stout in 1902 wrote that:

"The distinctive aim of the psychologist is to investigate mental events themselves, not their mechanical accompaniments or antecedents. If the course of mental events is not regulated by discoverable uniformities capable of being interconnected so as to form a coherent system, the psychologist has nothing to do."³

In a general textbook of psychology in 1892, Sully decided that:

"Its main concern is to give an account of the phenomena of the developed consciousness as it manifests itself in man. Such a scientific account will include a proper arrangement or classification of the various distinguishable factors that enter into our mental life, and also an explanation of their origin and development."⁴

1. McDougall, W. M.: An Introduction to Social Psychology, p.2.

2. p.25.

3. Stout, G. F.: Analytic Psychology, vol. 1, pp.3-4.

4. Sully, J.: The Human Mind, vol. 1, p.11.

McDougall's definition of psychology implied new, non-introspective techniques as well as new data. An increasing amount of experimentation with behaviour as the material was undertaken in the period under discussion. The first three volumes of the British Journal of Psychology (from 1904 to 1910) included a number of experimental studies of perception, accounts of tests of memory and colour preferences, and such reports as "A comparison of mental and physical tests in their application to epileptics and normals," by W. G. Smith, and "Experimental tests of general intelligence," by Cyril Burt. The attitude of most of these experimentalists to their role in psychology however was probably typified by C. S. Myers,¹ who published in 1909 A Text-book of Experimental Psychology, in which he pointed out that experimenting with behaviour is just one mode of studying psychological problems. The experimentalist, he said, is concerned only with those responses which throw light on the analysis and course of mental states; such data have much greater significance when confirmed by the subject's introspective record.² Undoubtedly the particular experimental techniques used were modelled largely on the example of German and American psychologists, but the independent recognition of the importance of studying behaviour possibly provided an appropriate context for their introduction.

Before 1900 only three writers besides McDougall seemed to be prepared to follow Darwin in emphasizing the study of behaviour. These were all physicians: Francis Warner, who wrote on Physical Expression - its Modes and Principles (second edition in 1885), Charles Mercier, who produced several books on normal and abnormal psychology and one on The Nervous System and the Mind (1888), and Henry Maudsley. The conversion of the first two to behaviour was not wholehearted, as was McDougall's. Mercier pointed out that the minds of other animals

1. MYERS, C. S.: 1873-1946, Professor of Psychology at King's College, London.

2. Pp.1,2,5.

and other human beings are accessible to the psychologist only by inference from the conduct which is their outward expression. "Hence the systematic study of conduct becomes an integral part of the science of psychology."¹ Warner considered the study of physical phenomena coincident with the manifestation of mind "more practical" than introspection - but did not, as did McDougall, treat physical expression as the manifestation of mind itself. Maudsley renounced introspection² almost altogether - it gives, he said, no information concerning the material conditions underlying mental, nor of "the statical condition of mind," and makes known to us only complex phenomena. A truly inductive psychology must begin where mind begins in the animal and infant, with very simple phenomena,³ and even earlier - for discrimination "is nowise a peculiar mental endowment; it is a fundamental property of organic element."⁴ Maudsley's chief emphasis was on the data of physiology. But he urged the objective treatment likewise of genetic psychology, degeneration of mind and development of the individual, by reference to such materials as language, myth and autobiography.⁵

This incipient shift in methodology to new data and techniques was probably instigated only indirectly by Darwin's theory and example. The early comparative psychologists after 1871 did not appear to feel obliged to copy Darwin's functional approach (which certainly would have been the easiest course for them), nor to have found any immediate difficulty in applying their own introspective-cum-observational-and-experimental techniques. As the need for propaganda to establish the fields of comparative and genetic psychology in their own right diminished, the proponents of these areas were able to work out a more satisfactory approach for themselves. None of these "behaviourists" instanced Darwin's method as a

1. Mercier, C.: The Nervous System and the Mind, p.13.

2. Cf. p.51.

3. Maudsley, H.: op. cit., pp.20-22, 29.

4. Maudsley, H.: Pathology of Mind, p.17.

5. Maudsley, H.: The Physiology of Mind, pp.50-3.

justification for their own. It seems significant that those who first emphasized behaviour (McDougall, Warner, Mercier, Maudsley) were all physicians and thus particularly interested in physiology.

DARWIN VERSUS LAMARCK

Details of Darwin's and each other's accounts of mental development were a source of disagreement to those of his contemporaries who, on one basis or another, came to accept mental evolution as a fact. An important source of this disagreement was the problem, taken over from biology, of the laws of inheritance. The chief issue, usually summarized as that of "Darwin versus Lamarck," centred upon the relative importance in the modification of species and their mental processes of natural selection and the inheritance of functionally acquired modifications. An increasing number of scientists, both biological and psychological, denied or questioned that hereditary transmission of acquisitions was possible at all. Darwin, as has been seen,¹ never took this view himself, and assigned an important role to acquired modifications in the mental evolution of species. Herbert Spencer, who anticipated Darwin in the matter of mental evolution, at first made the inheritance of acquired modifications his sole explanatory principle of the transmission of successive improvement of mental process through species. Yet his explanation of the existence of the primary data of consciousness, data for the relations of likeness and unlikeness, approached very near to a theory of natural selection. He pointed out that without elementary powers of discrimination, no organic being could nourish itself and so survive.² After the publication of The Origin of Species, Spencer effected a synthesis of this principle with that of natural selection in the second edition (1870-1872) of his Principles of Psychology.

1. pp. 7-8

2. V. p. 39

In the second edition Spencer maintained that in psychological evolution, where many co-operative parts need to be modified simultaneously, the inheritance of functionally-produced modifications is still the chief agent, with natural selection serving as an aid.¹ Spencer's opinion as to the relative roles of these principles did fluctuate. In 1887 he produced an essay on the subject of "The factors of organic evolution," in which he argued that the principle of natural selection needs supplementing by the inheritance of functionally-produced modifications in a small area. At the same time, the latter principle operates universally. In practice, it appears that Spencer assigned the chief role to natural selection at a very early stage of the scale of evolution. Here the variations on which it could operate were produced by the direct effect on organisms of the environment. The first forms of life were moulded by natural selection, which also causes differentiations of clusters of units.² In later stages of evolution, however, the inheritance of functionally-produced modifications is a more efficient and speedy cause of progress. For instance, in the area of the emotions, natural selection can adjust the guidance of pleasures and pains only to the circumstances of the habitat within which the species evolved.³ On the other hand:

"If functionally-produced modifications are inheritable, then the mental associations habitually produced in individuals by experiences of the relations between actions and their consequences, pleasurable or painful, may, in the succession of individuals, generate tendencies to like or dislike such actions."⁴

And in the area of social progress:

"If a nation is modified en masse by transmission of the effects produced on the natures of its members by those modes of daily activity which its institutions and circumstances involve; then we must infer that such institutions and circumstances mould its members far more rapidly and

1. Vol. 1, p.415

2. Spencer, H.: The Factors of Organic Evolution, p.57.

3. Spencer, H.: Principles of Psychology, 2nd edn., vol. 1, p.281.

4. Spencer, H.: The Factors of Organic Evolution, Preface.

comprehensively than they can do if the sole cause of adaptation to them is the more frequent survival of individuals who happen to have varied in favourable ways."¹

Although both Spencer and Darwin mentioned the direct effects of the environment as a cause of modification, neither of them utilized this factor in the course of their descriptions of mental evolution. The only reference made to it in a psychological work seems to have been by H. C. Bastian,² who did not employ it either. But the principle of inheritance of acquisitions received wide attention and application. Even before 1858, at least one writer besides Spencer expressed the opinion that acquired habits may be transmitted by heredity. This was Daniel Noble,³ who, as was pointed out earlier,⁴ subscribed to a belief in mental continuity over species - but Noble did not relate these two views. And psychologists were not alone in their adherence to Lamarckian theory. Even the idealist philosopher T. H. Green intimated his support.⁵ Samuel Butler, who wrote in a popular and teleological vein, attributed progress to racial MEMORY, which he identified with heredity. Each impregnated ovum is not a descendant of its ancestors, but "a continuation of the personality of every ovum in the chain of its ancestry;" each organism is the primordial cell.⁶ Instinct is inherited memory, and habit an experience transmitted after repetition in several generations.

"We have established the position that all living creatures which show any signs of intelligence, must certainly each one have already gone through the embryonic stages an infinite number of times, or they could no more have achieved the intricate process of self-development unconsciously, than they could play the piano unconsciously without any previous knowledge of the instrument."⁷

1. ibid., Preface.

2. Bastian, H. C.: The Beginnings of Life, p.585.

3. Noble, D.: op. cit., p.227.

4. Pp.32-3.

5. Green, T. H.: "Mr. Herbert Spencer and Mr. G. H. Lewes," Part 3, Contemp. Rev., vol. 32, 1877, p.770.

6. Butler, S.: Life and Habit, p.253.

7. ibid., p.76.

On the physiological level, Bastian, like Spencer, accounted for the origin of localized muscular tissue, and the habitual line of discharge along which impressions are discharged (nerve fibre) on the principle that use leads to inheritable structural change.¹

Within psychology itself, a varied range of writers adopted the principle of inheritance of functionally-acquired modifications. This principle Alexander Bain identified with "evolution;" he mentioned natural selection not at all. Bain himself made little use of the principle; it was not mentioned at all in the second edition in 1864 of The Senses and the Intellect, and in the third edition in 1868 only in a Postscript on Darwin's Expression of the Emotions.² Here he described Darwin's first principle of Serviceable Associated Habits as his "crown of glory as a theorizer," and said the hypothesis of inherited acquisitions would be difficult to replace in this area of expression. In the third edition of The Emotions and the Will (1875), a chapter was devoted to a consideration of the hypothesis. Here Bain agreed that some evidence, such as the strong resemblance between instinctive and habitual behaviour, was in favour of the theory, though few of the proofs advanced by others of the inheritance of acquired characteristics were considered decisive. Occasions where such transmission does occur must be rare, while under no circumstances can complex acquisitions be inherited. In any case:

"If we could suppose a selection made of the best brain in a family, and a breed taken from that, with a further selection to breed from again, we should far outstrip in rapidity any conceivable development arising by sustained mental exercise."³

This latter statement was simply a restatement of Galton's arguments in favour of eugenics, deduced from the principle of natural selection - but Bain was apparently unaware of this correspondence. In similar vein, he remarked that a

1. Bastian, H. C.: The Brain as an Organ of Mind.

2. Pp.697-714.

3. P.50.

necessary condition for the rare transmission of an acquired characteristic would be that the acquisition be beneficial to the animal.¹

Bain finally came to the conclusion that:

"Notwithstanding the deficiency of unambiguous cases of mental development, I am not deterred from entertaining the doctrine as both probable in itself and as facilitating our study of the mental constitution."²

But his work was not extensively affected by this conclusion. He considered that his leading postulates in the theory of the will, Spontaneity, Continuing of an action that gives pleasure, and Contiguous growth of an accidental connection, were all involved already in Spencer's explanation of the development of activity.³ The only phenomenon of mature Will in which Bain conceded a possible role to inherited acquired modifications was "the Graduation of expended force."⁴ The nature of Sympathy was reviewed, and the conception of it as a purely intellectual growth abandoned, in favour of the inclusion in it of an emotional element, supplied by the hypothesis of a gregarious origin in the past history of the race. In 1894 a fourth edition of The Senses and the Intellect apparently was published,⁵ which edition was supposed to be completely revised from the viewpoint of evolution theory. The dominating question now was, "whether or not we possess at birth a large contribution towards the full realizing of the three dimensions of the extended world" (Space, Time, Cause).

Apart from Bain, it seems that the only other psychologist of the period who did not at least express support of the principle of natural selection, while at the same time asserting the Lamarckian view, was J. D. Morell. Morell wrote that:

1. P. 59.

2. P. 53.

3. P. 318.

4. This "may be in part instinctive The power of readily assuming different degrees of discharge would be acquired in the course of spontaneous and random trials, but if utterly wanting at birth, it would probably take a very long time to grow. Yet it is not sufficiently confirmed to assert itself without a number of experiences." (P. 320)

5. This edition was unavailable at time of writing. Details obtained from Bain's Autobiography, P. 419.

"The whole fact, indeed, of the progress of races and the development of human civilization, depends, in all probability, upon the gradual evolution of new powers in the process of human life, and their transmission as hereditary tendencies in increasing ration from one generation to another."¹

Others effected a synthesis of the two principles. Henry Maudsley, for instance, ascribed the origin of instincts to both natural selection and the inheritance of acquired modifications acting jointly. Instincts are formed out of complex reflex actions by the accumulation of slight variations by natural selection. Such variations may be spontaneous, or due to the inheritance of acquired characteristics.² To specific problems, Maudsley applied sometimes one principle, sometimes the other. In character formation, the inheritance of ancestral habit seems important:

"A man could not think or do deceit habitually and naturally if his ancestors for generations before him had not thought or done deceit."³

With regard to insanity, natural selection plays a determining role. Those who inherit a predisposition to insanity are less favourably placed in the struggle for life than those who do not.

"When the insane temperament has been developed in its most marked form, we must acknowledge that the hereditary predisposition has assumed the character of deterioration of race and (will) end in the extreme degeneracy of idiocy."

With idiocy comes extinction, for idiots are impotent and sterile.⁴ G. H. Lewes treated mind not as a passive recipient of external impressions, but as an active organ with its own laws and history. Mind brings with it evolved modes of action inherited from its ancestors, and inherited experience - only the structural modification being transmitted, and not the incidents which caused that modification. But Lewes emphasized the gradualness of assumption of new functions and

1. Morell, J. D.: op. cit., p.49.

2. Maudsley, H.: op. cit., pp.217-8.

3. Maudsley, H.: Natural Causes and Supernatural Seemings, p.158.

4. Maudsley, H.: Responsibility in Mental Diseases, pp.45-7.

characters. Unlike Spencer, he did not assign priority to function; action cannot precede the agent, so a structural variation must occur first, and its further development interacts with any increase in its use. "Inherited superiority will not by mere transmission become greater."¹ Natural selection encourages the transmission of these structural modifications; Lewes modified the principle of natural selection, by extending it to the competition amongst organs and tissues.²

The position of writers like Maudsley and Lewes was summarized and assessed by Sully in 1892:

"While the older psychologists set out with the first vague manifestations of the individual mind as an absolute beginning, the modern evolutionist views the nervous organization of the infant as embodying the results of ancestral mental experience."

The dubious state of the evidence for this viewpoint was admitted, and Sully pointed out that the most it could imply was, not that the child inherits conscious states prior to experience, "but only that it has certain organic arrangements which prepare the way for particular psychical processes when individual experience is added." The doctrine of natural selection superadded to this view enables the psychologist to interpret what he finds to be permanent as owing its stability to its utility or adaptation to life-circumstances.

"Applying this conception to the psycho-physical arrangements which constitute the common instinctive base of our mental life, the psychologist can suggest how, in the course of the evolution of man and his progenitors, certain arrangements may have been built up."³

But Sully did not point out that most writers gave a one-sided emphasis to one or other of these aspects, and found the relationship an uneasy one. Almost always the one-sided emphasis was in the direction of natural selection. Romanes, for example, was never able to dissuade himself of the possibility of the occurrence of inherited acquisitions. In his earliest work, this principle and that

1. Lewes, G. H.: op. cit., pp.73-5, 107.

2. ibid., Preface.

3. Sully, J.: op. cit., vol. 1, p.32.

of natural selection were to be found in close connection. For instance, when discussing the increase in localization of nervous function in 1877, he described how, "Gradually, by the combined action and mutual reaction of use and survival of the fittest, this function would come to be performed with ever-increasing precision."¹ But very soon the contribution from inheritance of habit came to be treated as unimportant. Regarding memory, Romanes wrote in 1883:

"A present sensation is perceived as like or unlike a past one. It makes no essential difference whether the past sensation was actually experienced by the individual itself, or bequeathed to it, so to speak, by its ancestors."²

At the same time, the Lamarckian principle did provide a useful explanation of the origin of non-intelligent habits of a non-adaptive character³ - but still it just supplemented explanation in terms of natural selection. The genesis of reason was attributed entirely to the force of natural selection:

"As during the course of evolution the lower forms of life are required progressively to adjust their actions to circumstances of growing complexity and inconstancy, or to occasions of growing infrequency, it follows that the organized instincts with which they are endowed must at some point begin to become inadequate; a greater flexibility in the power of adjustive response is needed, and if any such flexibility is possible under the conditions of ganglionic action, those individuals which best attain to it will survive, and so the improvement will become general to the species. Now we know that such an increase of flexibility is possible under the conditions of ganglionic action, and this increase of flexibility on its subjective side we know as the faculty of reason."⁴

The principle of natural selection Romanes found needed supplementing by one of his own concoction, physiological selection. In natural selection, he argued, only variations that are useful are preserved, while the useless ones die out by intercrossing. If intercrossing is restricted (by physiological selection), useless variations may be preserved and develop new varieties.⁵

C. L. Morgan's attitude to the inheritance of acquired modifications was very critical. In his early work, he admitted that innate desires, emotions and ideas

1. Romanes, G. J.: "Evolution of nerves and nervo-systems," Nature, vol. 16, p.291.

2. Romanes, G. J.: Mental Evolution in Animals, p.116.

3. ibid., p.185. 4. ibid., p.319.

5. Romanes, G. J.: Life and Letters, pp.165-6.

are the result of ancestral experience transmitted by inheritance - though in the individual such ideas are probably only developed by sense impressions.¹ But by 1896 he was arguing that while some instinctive process might possibly be due to the inheritance of acquired habits, in the present state of knowledge it was best to attribute everything directly or indirectly to natural selection. Acquired modifications might pave the way for congenital variation, by resulting from an innate plasticity rendering adaptive behaviour possible, without any direct transmission as such.² Natural selection continued to be liberally applied as an explanatory principle, for instance in the evolution of the emotions;

"Emotions, as the psychological accompaniment of orderly disturbances in the central nervous system, profoundly influences behaviour and often renders it more vigorous and more effective. The utility of the emotions in the struggle for existence can, therefore, scarcely be over-estimated, and they are inevitably enhanced by natural selection."³

Morgan's final conclusion as to the position of functionally acquired modifications in 1900 was that:

"Acquisition of that which has beneficial value in behaviour depends on a consonance between psychological and biological end. But this consonance is dependent on survival Even if we grant, therefore, that the effects of acquisition are inherited, the conditions of beneficial acquisition are dependent on natural selection."⁴

Morgan actually developed on a small scale his own theory of the mechanism of inheritance, to provide an origin of variation independent of functionally produced modification. Variations, he said, arise from a determinate process of synthesis in the zygote.⁵

Mendel's papers were not rediscovered until 1900, and the existence of genes was not hypothesized till some time later. The most informed argument against the Lamarckian principle came from August Weismann in Germany, who challenged it

1. Morgan, C. L.: The Springs of Conduct, p.31.

2. Morgan, C. L.: Habit and Instinct, pp.305-313.

3. Morgan, C. L.: "Mental factors in evolution," in Seward, Op. cit., p.435.

4. Morgan, C. L.: Animal Behaviour, p.289.

5. Morgan, C. L.: An Introduction to Comparative Psychology, pp.349-351.

in 1882 on deductive grounds. At first Weismann attributed all variation to sexual reproduction. His basic postulate was the continuity of germ-plasm, which has been absolutely stable since the origin of sexual reproduction. Germ-plasm, which is complex and particulate, constitutes the material basis of heredity, lodged mainly in highly specialized cells. By 1893 he modified this view of the cause of variation somewhat:

"The cause of hereditary variation must be deeper than this. It must be due to the direct effects of external influences on the biophores and determinants."¹

Weismann nowhere pointed out the effects of this change of opinion on his theory of evolution by natural selection alone. Sexual reproduction he said must still play an indispensable part in the process of evolution, as in all cases it is a necessary condition to the occurrence of natural selection.

Wallace consistently opposed the doctrine of the inheritance of acquired modifications, and held that natural selection is the only means of evolution. Wallace argued that if the operation of natural selection on any part or organ were suspended, free intercrossing would combine with the fact of regression towards mediocrity (demonstrated by Galton) rapidly to reduce the mean value in the progeny to a value greatly below that of the ancestral survivors. Galton himself in 1869 in Hereditary Genius seriously questioned the transmission of acquired characteristics. Here he propounded a doctrine of the continuity of germ-cells which almost excluded the possibility of such transmission; the particulate elements of reproduction (which resemble Darwin's gemmules) proceed mainly, but not entirely, in the direction of germ-cell to some. As a result of experiment and further refinement of his biological theory of inheritance, Galton by 1875 completely rejected the doctrine of the inheritance of modifications, and Darwin's theory of pangenesis, which allowed of the possibility of this.²

1. Quoted Romanes, G. J.: An Examination of Weismannism, p.153.

2. Galton, F.: "A theory of heredity," Contemp. Rev., 1875; ref. Pearson, K.: Life, Letters and Labours of Francis Galton, vol. 2, p.184.

Although Galton later made certain alterations to the theory of natural selection, regarding the material on which the process operates, it remained central to his thinking. The motivation behind much of his research was derived from his interest in eugenics, or selective breeding of man for favoured attributes - a speeded-up process of natural selection by means of enforcement of differential rates of reproduction.

Galton's treatment of the data of human variation and inheritance was vastly extended by Karl Pearson¹ and his students and collaborators. Pearson endeavoured to define biological terms describing the general process of evolution with quantitative exactness; the main question for him was not the validity of Darwinism, but the rate of effective change. Pearson's attitude was that science is description, and not explanation, and he was also interested in predicting the future course of evolution. In his "Mathematical contributions to the theory of evolution,"² no formulae were included which could measure differential rates of change due to selection of each of spontaneous variations and inheritable acquired modification. Natural selection was defined in two ways: firstly, as a Secular process measured by the changes, due solely to mortality, in the mean and standard deviation of the variation curve as we pass from one adult generation to the next; secondly, as a periodic process measured by the changes due solely to mortality, in the mean and standard deviation of the variation curves at successive stages of the same generation (allowance being made for changes due to growth).³ As variation was defined just by a normal probability curve, any different sources of variation could not be distinguished. There was no means for measuring the results of a change-producing process independent of natural selection, such as the inheritance of acquired characteristics without

1. PEARSON, KARL: 1857-1936, first incumbent in 1904 of Galton's research fellowship in eugenics at London university; editor of Biometrika from 1901.

2. Philos. Transacns., 1894-1901.

3. ibid., Part 3, 1896, 187 A. p.257.

survival value and not naturally selected. Pearson's avowedly empirical approach was undoubtedly biassed; natural selection was the sole means of evolution. He considered that all human history could be described in terms of this process.¹

In the last fifteen years of the period studied, it seems that the majority of psychologists were averse to the principle of the inheritance of acquired modifications, although the issue was not really settled. Writers such as G. A. Reid (on The Present Evolution of Man in 1896) had no qualms about rejecting it out-of-hand.² E. R. Lankester took what he considered valuable from the Lamarckian contribution without adopting the Lamarckian viewpoint himself. He argued (and Morgan agreed) that educability of the organism is increased by natural selection, and that the acquisition of new modes of response by the individual is thus facilitated, though the acquisitions themselves are not inherited.³

A number of later writers who excluded the Lamarckian explanation in favour of natural selection were reluctant to apply the process of natural selection to man in his fully civilized state. Pearson considered that:

"In civilized man the survival of the fittest appears to be replaced by the survival of the most fertile,"

and denied that the most fertile are the most intelligent or the socially fittest.⁴ Benjamin Kidd, who wrote on Social Evolution (1894), described human history in terms of a conflict between natural selection, which tends to the production of maximum social efficiency, and the growth of reason, which would put the interests of the individual before those of society. W. H. Mallock, in Aristocracy and Evolution (1898), emphasized the role of "the great man" in furthering evolution. The great man need not be the fittest; the fittest men, by surviving, raise the general level of the race and thus promote progress; the great man intentionally and more rapidly promotes it, by virtue of his superiority to his contemporaries.

1. Pearson, K.: The Grammar of Science, p.362. 2. P.60.

3. Lankester, E. R.: "The significance of the increased size of the cerebrum,"

Nature, 1900, pp.624-5.

4. Pearson, K.: The Chances of Death, pp.102,128.

Others considered that the exclusiveness of the operation of natural selection diminishes, not as the result of developing civilization, but as a consequence of the development in man of higher mental faculties. Wallace and Murphy suspended the operation of natural causes in the region of the very highest mental processes. Morgan however argued that the elimination of the operation of natural selection is only gradual, and occurs only in the realm of conscious processes associated with neural processes which do not lead to motor activities:

"When the neural processes which intervene between stimulus and activity become more complex and more roundabout, when, instead of being directly and closely associated with life-preserving activities, they are associated indirectly and remotely; - then they become, step by step, removed from their subjection to natural selection."

Instead, there is elimination by incongruity.¹ James Ward² wrote that natural selection seems to lose in importance as we advance toward the higher stages of mental life, and to be replaced by subjective selection, which operates through the association of particular movements with particular sensations through feeling.³

The issue thus had a changing history during the period. Very few writers after 1858 advanced the Lamarckian hypothesis by itself. A few made a satisfactory synthesis of the two principles. But the balance swung in the favour of natural selection, even in the works of most of those who utilized both explanations. By 1900, most writers had completely rejected the Lamarckian theory, on a variety of grounds; a number of these were reluctant to apply the principle of natural selection all the way up the scale of mental development.

By 1900, also some writers in the areas of comparative and genetic psychology, such as Stout and McDougall, hardly found it necessary to mention the issue of particular explanatory principles of mental evolution at all.

.....

Logically, it was possible to believe in the continuity of mental forms throughout species without believing that these had evolved naturally from each other. Only Wallace however seemed to make this separation. The former belief would have been adequate to stimulate a comparative psychology, though both were implied by genetic psychology. As genetic psychology relied on comparative psychology for its data, the two areas were in practice usually treated together. The theory of mental evolution was of direct relevance only to these two areas of psychology, to social psychology historically treated, to child psychology when a recapitulation theory was applied to mind, and in a very minor way to the study of mental pathology. On the study of the normal mind of the civilized adult it bore only indirectly; the genetic method supplied different bases of classification to those usually reached by analysis.

-
- Contd. (2. Ward did not assert that natural selection is the sole agency in
from (evolution, but avoided the problem of the Lamarckian hypothesis by
last (treating mental evolution as if it were the history of one individual.
page (3. Ward, J.: Section on "Psychology" in Encycl. Brit., 9th edn., 1886,
vol. 20, p.73.

PROPAGATION

It is apparent from the foregoing sections that the idea of mental evolution, implying both continuity of mental forms throughout the animal kingdom and their affinity by descent, met with fairly ready and widespread acceptance in psychology, once the fact of organic evolution was acknowledged. The chief opposition to the theory has already been described,¹ and the chief persuading argument, from the nature of the relation of mind to body, discussed.² Here only a brief chronological account of the propagation of the theory of mental evolution will be given. This will be followed by a discussion of the expansion and treatment of different areas of psychology consequent upon its adoption. Those concerned with establishing the theory usually combined their arguments with evidence from a comparison of mental processes in different animals, and with inferences as to the actual course of mental development, both in the past history of the whole animal kingdom and in the contemporary history of the individual man. A separation of these areas for purposes of exposition will necessarily be artificial.

It has already been established³ that the idea that there was no essential difference between the nature of human mental process and that of animals was current in the 1850's, before publication of The Origin of Species. Further, Spencer had in 1855 offered an explanation of such continuity, by postulating his own theory of mental evolution. After 1859, the question of evolution came increasingly to be viewed as one common to psychology and biology, with similar problems arising for each - adaptation, variation, recapitulation, inheritance and so on. Darwin's biological treatment of instinct demonstrated that one area formerly regarded as the property of psychology was subject to the biological laws

1. Pp.46ff.

2. Pp.48ff.

3. Pp.31ff.

of evolution. Huxley in 1864, in an attempt to settle the question of the biological evolution of man, came to the conclusion that:

"even the highest faculties of feeling and of intellect begin to germinate in lower forms of life."¹

The Descent of Man in 1871 was the first work to deal at length with the problem of mental evolution and to incorporate the principles of the inheritance of functionally acquired modifications ~~with~~ and natural selection. In it mental process was treated from an essentially biological standpoint, as adaptive or useful function of the organism. Up to about 1890, most of the writers on mental evolution came to this area of study by way of the biological sciences - zoology and physiology. An explicit avowal of the reason for his interest was made by the biologist H. R. Marshall, who said he sought in the facts of mental evolution hints for the better understanding of organic evolution.²

Despite this interest by biologists in mental evolution, the 1860's produced virtually nothing on the subject on a psychological or a biological level, beyond Huxley's brief comment. No-one but Spencer seemed prepared to extend the application of Darwin's theory from the facts of organic progress to those of mental development until he did so himself. (The publication dates of the second edition of Spencer's Principles of Psychology - 1870-1872 - overlapped that of The Descent of Man - 1871). The output of Bain continued to be large in the 1860's as in the previous decade, but only in a postscript to one of his five major publications³ (the third edition of The Senses and the Intellect) was evolution mentioned at all, and there the word referred exclusively to the Lamarckian principle. (In his Autobiography, Bain remarked that all one can do

1. Huxley, T.: op. cit., p.108.

2. Marshall, H. R.: Op. cit.

3. On the Study of Character, 1861; The Senses and the Intellect, 1864 and 1868; The Emotions and the Will, 1865; Mental and Moral Science, 1868.

is speculate concerning origins,¹ and in his Dissertations wrote that the evolutionist is very limited in his speculation by the lack of introspective data.²).

The first edition of Spencer's Principles of Psychology did not succeed in introducing into psychology in general his Lamarckian hypothesis of the cause of mental development. Only Morell in 1862 professed himself indebted to Spencer, adopted the hypothesis of the inheritance of acquisitions, and proceeded to reconstruct the analysed elements of mind:

"so as to exhibit the structure of the human mind in the natural order of its growth."³

Morell did not wholly abandon the metaphysical law of development formulated by him in 1853, Spencer notwithstanding. Man, he wrote in 1862, embodies three forces - vital force, nerve force, and mind force.

"The mind-force gives intelligent direction to our activity, and enables us at once to grasp and carry out the purposes for which the entire complex of our nature was designed."⁴

In 1862 Spencer began publication of his general system illustrating universal laws of progress throughout all orders and existences, with First Principles. The second edition of Principles of Psychology formed an integral part of the system. Apart from the grafting on of the theory of natural selection, this was simply an expanded version of the first edition. Spencer did not attempt to conceive how sensation in the ultimate is possible, but just traced the course of mental development, viewed as :

"an adjustment of inner to outer relations that gradually extends in Space and Time, that becomes increasingly special and complex, and that has its elements ever more precisely co-ordinated and more completely integrated."

1. Pp.318-9.

2. P.180.

3. Morell, J. D.: Introduction to Mental Philosophy, Preface.

4. ibid., p.19.

A more specific feature of development is the degree of representativeness in states of consciousness, indicated by the extent of integrations of ideas, the greater definiteness with which they are represented, the greater complexity of integrated groups, and the greater heterogeneity among their elements.

Spencer did not bother to draw the line of division between man and the lower animals, nor self-consciously to justify his belief in mental evolution. The second edition however made a much greater impact than the first. Although no-one borrowed Spencer's most general principles in toto, a number of his ideas were conspicuously present in later writings on mental evolution. Even Bain was sufficiently impressed to include a whole chapter on evolution (that is, the inheritance of acquisitions) in the third edition of The Emotions and the Will in 1875. W. B. Carpenter was persuaded of the inheritance of acquired characteristics by 1874, when he produced his Principles of Mental Physiology,¹ and Samuel Butler began his anti-Darwin propaganda in 1877 with the assertion of this Lamarckian view.² Examples of notions more specifically originated by Spencer and widely adopted by others are: Firstly, the theory of the development of nerve fibre by the habitual transmission of impulses along the line of least resistance (utilized by Romanes in 1877 and by Bastian in 1885³). Secondly, the correspondence theory, that development takes place as the organism adjusts its responses to harmonize with an environment increasing in complexity (this theory appeared in the works for example of Bastian⁴, Morgan,⁶ Maudsley⁷, and Romanes⁸). Thirdly, the view (originally propounded with regard to embryology by Von Baer)

1. P.91.

2. Butler, S.: Life and Habit.

3. Romanes, G. J.: "The evolution of nerves and nervo-systems," Nature, vol. 16, no.406, pp.289-292.

4. Bastian, H. C.: op. cit., p.21.

5. ibid., p.62.

6. Morgan, C. L.: Introduction to Comparative Psychology, p.211.

7. Maudsley, H.: The Physiology of Mind, p.91.

8. Romanes, G. J.: Mental Evolution in Animals, p.319.

that evolutionary development can be described as a progressive differentiation of structure and of function - this description was used by all who spoke of psychological evolution, including Darwin himself. G. H. Lewes in particular put the definition to extensive use.¹ The lectures of W. K. Clifford exemplify the widespread borrowing from Spencer's writings that took place. Clifford defined as the marks of biological and psychological improvement, increased differentiation and integration of parts, increased differentiation of the organism from its environment and increased correspondence between them, increased differentiation of the organism from other individuals and more connection between them.²

Quite apart from the question of the influence of Spencer's specific theories was the fact of the spate of publications propagating the notion of mental evolution following The Descent of Man and Principles of Psychology. It seems reasonable to suppose that publication of these two works jointly stimulated this voluble interest in the topic of mental evolution, since the ideas of each can be traced in these later writings. From 1873 onward, besides those who were trying to put the idea of mental evolution on a firm scientific basis, were others who needed no further convincing but simply assumed it as a fact, and proceeded from there with their own specific interests. Some such writers were Henry Maudsley, Charles Mercier, W. B. Carpenter, Francis Galton, J. F. McLennan, James Ward and later Benjamin Kidd, W. H. Mallock, G. F. Stout, W. M. McDougall, and James Sully, whose contributions will be considered in the ensuing section and chapters.

Foremost in his efforts to secure recognition of the fact of mental evolution was Romanes. In 1882 he produced Animal Intelligence, a text of the facts of

1. V. Ch. 5.

2. Clifford, W. K.: op. cit., p.95.

comparative psychology from the protozoa upwards, considered in relation to the theory of descent. The data presented was anecdotal in style, and was selected to demonstrate the close resemblance of animal to human intelligence. Romanes pointed out to his readers that they must realize the progressive weakening of inference of animal mental processes from analogy with ~~their~~ own as his data proceeded from successively lower forms of animal life. His criterion of mind was whether the organism learns to make new adjustments or to modify old ones as a result of experience. In 1883 appeared Mental Evolution in Animals, followed in 1888 by Mental Evolution in Man. In the first book, Romanes quoted the Spencerian explanation of the development of nervous action, and explained that ideation undergoes a corresponding grouping and compounding of elements. The ultimate peculiarity of mental life is the power of choice (on the physiological level discrimination), which to be useful and thus to survive must be combined with the power of co-ordinated movement in the lower stages of development. But once the stage of tool-using is reached, the power of discrimination can develop independent of muscular co-ordination or adaptive response. The origin and development of various aspects of mental experience - pleasure and pain, memory, perception, imagination, instinct and reason - were traced by Romanes in these terms, with frequent resort to the principle of natural selection and occasionally to that of inherited acquired modifications. Reason was described as "flexibility in the power of adjustive response," being continuous with perception. The highest stage of reason reached by animals is the inferring of unperceived objects. In the second book, Romanes pointed to a number of a priori considerations in favour of the theory of mental evolution in man - the observable development in the history of the race and of the individual - before proceeding to examine the nature of the difference between human and animal mental faculties. The distinction, he concluded, lies in man's powers of generalization and abstraction of ideas,

which depends on language. Animals he showed to be capable of compound ideas, or receipts, and of predication - but not of naming, known as such. So the development of self-consciousness is crucial - animals have a practical recognition of self as an active and feeling agent, but not as an object of knowledge. The only account Romanes gave of the origin of these differences consisted of a description of the mental development of a child, which he assumed paralleled that of the species.

Romanes' argument for mental evolution was thus composed of an incomplete exposition of the process of mental development, and an interpretation of the data of comparative psychology which tended to raise the level of animal intelligence close to that of man. Morgan on the contrary endeavoured to reduce the gap by lowering the level of human intelligence: in 1894 he formulated a law of interpretation of behaviour:

"In no case may we interpret an action as the outcome of a higher psychical faculty, if it can be interpreted as the exercise of one which stands lower in the psychological scale."

In 1885, in The Springs of Conduct, Morgan described how Darwin's theory applies to the evolution of behaviour from the psychological ultimates of sensation, pleasure and pain. Here he first advanced the theory that every physical process has its psychological accompaniment - making logically inevitable the deduction of mental evolution from the theory of organic evolution. In 1890, he published Animal Life and Intelligence, wherein he discussed the nature of human mental process in order to consider how far the symbolic world of animals resembles that of man. The essential difference, he agreed with Romanes, is not one of origin, and lies in man's power of conception and his self-consciousness. Having discussed the evidence for mental continuity, Morgan went on to assert mental evolution just as a hypothesis, based on his assumption that mental and physical processes are just aspects of the same thing. The facts can be explained by the theory that

natural selection ceases to operate on neural processes in the brain when they reach a sufficient stage of development (reached only by man), far removed from all bodily and life-preserving activities.

Morgan's arguments in favour of mental evolution were thus various. In 1894, in An Introduction to Comparative Psychology, he corrected and refined his interpretation of the animal mind by the law quoted above. Further, he offered an explanation of the process of development in the perception of relations, a process crucial to the distinction he drew between man and animals. (It was assumed that impressions and ideas exist in sense-experience; since the latter is continuous, there is also a consciousness of transition between these impressions and ideas. This transition, when focussed through reflection, becomes the relation, the focussing of it being the perceiving of the relation. Only when one looks back on the results of considerable experience - which only man can do - does the permanence of a relation beget a general conception). In 1896 (Habit and Instinct) Morgan first advanced his own theory concerning the course of mental evolution, which moves in the direction from innate structural determination of response to innate plasticity and educability. This idea was further developed in Animal Behaviour in 1900, where the stages of mental evolution were clearly distinguished and named.

Morgan's arguments thus included a demonstration of the fact of mental continuity, the reduction of the distance between the human and the animal mind, deduction from the theories of organic evolution and psycho-physical aspects, and the suggestion of detailed theories relating to single aspects of evolved mental process.

Arguments on narrower grounds were advanced by Medlicott, Lewes and Bastian. In a pamphlet on The Evolution of Mind in Man (1892), H. B. Medlicott stated that the sole difference between man and brute depends on knowledge. Knowledge consists

of relations, which are non-material so that no sensation of them can be recorded in the brain. Instead, this function is filled by language, which supplies:

"a material notation whereby the brain can take hold of the unseen world of relations, and ~~so~~ convert experience, as unconsciously recorded in 'mere consciousness,' into knowledge; introducing mind into the organism, changing the brute into the man."

Language itself is evolved by natural selection from the sign-language of animals. On a physiological level, G. H. Lewes² proposed the idea that sentience is the property of all living tissue, so that all psychical phenomena must develop from one basic process in one vital tissue. As structures and functions become differentiated, so do their psychological concomitants. From the grouping of groups of neural elements, all varieties of mental process arise. To explain the wide gap between human and animal mental process he pointed to man's social medium, with its accumulation of experience. H. C. Bastian, in The Brain as an Organ of Mind (1835), identified or speculated about the neural concomitants of various mental processes, and traced the course of mental evolution by tracing the development of the central nervous system.

It is possible that these works directed to establish the fact of mental evolution were intended to convince the general public rather than the psychologists. For psychologists, the material contained in them would have been of interest for its own sake and not just as propaganda. The works of Romanes and Morgan had a wide popular appeal and success. Meanwhile, a majority of the psychologists active in the last quarter of the century were assuming and putting into application the theory of mental evolution.

1. P.25.

2. In Problems of Life and Mind, 1874-9.

APPLICATIONS

THE COURSE OF MENTAL DEVELOPMENT

During the 1850's the course of mental development through the animal kingdom from the simplest elements of mind up to the highest mental processes was becoming a subject of interest in its own right to writers such as Carpenter, Morell and Spencer. The associationists previously and Bain still, considered only the course of mental development in man. Darwin concerned himself with the problem of universal mental development only in order to illustrate the universal applicability of his theory of evolution by (mainly) natural selection. From 1870 onward, a number of writers combined in their work this attitude of Darwin with Spencer's more particular interest in the topic itself. Still others took the fact of mental evolution as established, and proceeded to plot the path either of mental development in general or of specific aspects of it. Genetic psychology became an increasingly independent and thriving offshoot of the psychology of human mental process. But it remained in close contact with the psychology of the adult human mind. Spencer himself insisted that classification of human mental process should be made only on a genetic basis, that is, on a consideration of their place in the order of universal mental evolution.¹ But many of his successors emphasized the importance of an understanding of human mental process before inferring the nature of animal mental process from animal behaviour, and thus before plotting the stages of mental evolution. Thus Morgan inserted a chapter on human mental process at the beginning of his Animal Life and Intelligence, and Romanes pointed out that though the human mind might not be a very good analogy to the animal mind, it is the only one we can use.²

1. Spencer, H.: Essays, vol. 1, no. 7.

2. Romanes, G. J.: Animal Intelligence, p.10.

Stout declared that his main interest lay in developmental psychology, but that he found he needed an analysis of fully developed consciousness before pursuing this interest. He therefore prefaced the Manual of Psychology (1898) , a genetic and synthetic investigation of the origin and growth of certain products of mental process which emerge in the normal course of evolution of every human mind, with two volumes of Analytic Psychology in 1896.

Inevitably there was disagreement between writers as to the actual course of mental development. The main point about their work of relevance to the present topic is that they wrote on the theme at all. However, a few examples of their conclusions will be given, and one of their main controversies, concerning the relationship of instinct to intelligence, will be discussed.

Most of these developmental psychologists, like the early associationists and Spencer, adopted a monistic view of mental processes. The processes of mind were supposed to differ merely in complexity, having evolved from one simple activity or element. For Spencer, this fundamental activity was simple reflex action, based on data for the relations of likeness and unlikeness. Apart from Spencer, and Romanes who just copied him here, psychologists did not try to trace the physical origin of these basic elements. The monistic attitude was so strong in Ward that he objected to the very idea of classification in psychology. The primary fact of mental life Ward considered to be awareness, or presentation. Feeling and conation are built upon this basis - so we have:

"a Subject, non-voluntarily attending to changes in the sensory continuum, being in consequence either pleased or pained, and by voluntary attention or 'innervation' producing changes in the motor continuum."

All varieties of thinking and acting are to be explained by the laws of association pertaining to ideas or presentation, leaving to the Subject only the power of variously distributing his attention, but "this complexity and differentiation

of parts never become a plurality of discontinuous presentations."¹ The process of development was traced in broad outline by Ward, who avoided the decision of whether to consider mental development continuously in the individual or discontinuously in the race (discontinuous because of death and birth) by treating the whole of mental evolution as the history of just one organism

It was more fashionable to make feeling the basic element. Sully did so, while stressing the interaction of feeling, cognition and conation on higher levels. Sully himself believed that the main method of the psychologist is analysis, but the latter procedure must "regard a psychical phenomenon as formed or developed by the aid of certain materials or elements supplied by antecedent experience." Because introspection fails to reveal to us the process of development, we must resort to "a wide objective comparison of psychical phenomena as a basis of sound scientific induction."² Sully was reluctant to name stages in the process of mental elaboration outlined by him, but pointed out that the process required attention, with discrimination, assimilation and association. The development of perception, for instance, was traced from the primary sense-image, through the after-image, the primary memory image, to images which revive after a lapse of time, and thus to thought by processes of reflective attention implying abstraction and comparison. (These stages in fact closely resembled Bain's.)

While Stout's exposition in 1898 was only of the development of mind in man, he illustrated it by reference to the mental life of animals and primitive races - thus assuming the recapitulation theory of mind, that the course of individual mental development is a speeded-up reproduction of that of mind in general. Stout considered consciousness to consist in modes of the subject-

1. ibid., p.46.

2. Sully, J.; op. cit., vol. 1, pp.23-5, 27.

object relationship - cognition, conation and affection. The most primitive form of mental life is the sensation-reflex, consisting of a single act prompted only by a stimulus, and not by any meaning attached to it. Perception emerges when a sensation issues in movement, and at the same time determines action by its significance. Perceptual process combines a series of acts directed to a single end. While all that is necessary for perception in a rudimentary form depends on the inherited constitution of the nervous system, association and reproduction are necessary for its development. The traces of perceptual activity combine in a cumulative disposition which acquires meaning. Ideations depend on imagery and the meaning conveyed by it, but is very primitive without language (which originates from the motor elements of the mental image). The origin of Will is accounted for by the evolution of the ideal construction of "self," as a whole uniting present, past and future phases, built up in the course of experience and as a result of social pressure and example. Volition is a desire qualified by a judgment that the subject shall try to bring about the desired end; voluntary decision results where one tendency included in the conception of the self gets predominance over another. Stout considered the placing of animals along this human continuum of mental development.

L. T. Hobhouse¹ considered the simplest form of mind to be an action vaguely directed to a change of condition, determined by the contrast between the existing state of the organism and relief. (Hobhouse was led to this emphasis on conation as a result of his approach to mind as function and not as state; we can only compare functions of the inner processes of animals with those of ourselves, and not the processes themselves. Mental function is distinguished from mechanical by being wider in scope and more complete in the detail of its adjustment.²)

1. HOBHOUSE, L. T.: 1864-1929, Professor of Sociology in University of London.

2. Hobhouse, L. T.: Mind in Evolution, pp.6-19.

This simple form of conation is followed by reflex, sensori-motor action and instinct. In the growth of the power of correlation of past experience with subsequent action, the first stage beyond instinct, lies the evolution of mind. Hobhouse performed his own experiments with various animals to find the extent to which they learn by perception of relations. He concluded there are four great stages in the development of intelligence: inarticulate correlation, involving modification of inherited response by experience of its effects; concrete experience and practical judgment, in which a perceptual relation is brought more explicitly into consciousness; conceptual thinking and will, an exclusively human process depending on language; and rational system, where experience and purposes are grouped into more or less organized bodies.¹ In 1906 Hobhouse considered a specific area of mental development, Morals in Evolution, through a comparative study of the regulation of behaviour throughout the organic world and the races of man.

Psychology, said McDougall, "must be an evolutionary natural history of the mind."² McDougall held that mind, like the nervous system, is organized into a hierarchy of levels. However, he considered that all higher levels are syntheses of sensations and corresponding images with their accompanying feelings.^{3,4} The links of association are not between sensations or ideas, but between the nervous dispositions underlying them. Congenitally linked systems are instincts, but as we ascend the animal scale, we find these may be increasingly modified by experience, to form sentiments.

1. ibid., pp.400-7.

2. McDougall, W. M.; An Introduction to Social Psychology, p.13.

3. McDougall, W. M.; Physiological Psychology, p.92.

4. To the problem of the combination of sensations McDougall applied a theory of local signs - each sensation is spatially distinguishable from others of similar quality only by some mark peculiar entirely to itself.

Theories of the course of mental development such as the above had a considerable influence. The monistic interpretation of mental activity as being an elaboration of one basic process was adopted by early factor analysts. Spearman believed that correlations between different cognitive activities are all due to the inevitable presence in tests of them of the basic element of discrimination. New areas of psychology were opened up to study mental development at different stages - in children, savages, animals and the insane. Writers with opinions of their own to illustrate outside the area of psychology borrowed extensively from these more specialized works. Such were J. M. Tyler, who in The Whence and the Whither of Man (1896) sought to find the bearing of evolutionary theory on religious and moral beliefs; or G. A. Reid, whose book The Present Evolution of Man (1896) was directed towards demonstrating the non-adaptive character of alcoholism.

The question of the genetic relationship between instinct and intelligence was not mentioned by Darwin, except insofar as he suggested that man (the most intelligent animal) might have fewer instincts than the lower animals, and assigned in the development of instincts a minor role to the inheritance of acquired and presumably intelligent habit. Spencer took the view that instinct is nothing more than complex reflex action, and intelligence just more complex instinct. His supporters on this line advanced various proofs. Maudsley reasoned from the analogy of brain development that the complex phenomena of mind are formed out of the more simple by progressive specialization and integration. Bastian adopted Spencer's neural parallel to mental development. He pointed out that in reflex action, nerve fibres are continuous in a nerve-centre or ganglion with sensory and motor nerve cells, from whence issue the outgoing fibres. Close proximity in the ganglia doubtless facilitates the establishment of structural connections between cells functionally related.

"Thus it seems to result from the very nature of nerve tissues and their mode of development, that variations in the kind and combination of impressions acting upon any particular organism, as part of its life phenomena, become by slow degrees organically linked to different, and severally appropriate motor results. The organism 'learns' to discriminate one impression from another, either consciously or unconsciously - as we are compelled to infer, from the different nature of its motor responses and the suitability of each as an answer to the impression which it follows."

And discrimination is the basis of intelligence.¹

Romanes considered that instinct could originate in two ways. The Primary instincts, he thought, develop in the method described by Spencer:

"Instinct is reflex action into which there is imported the element of consciousness."²

Similarly, reason develops when a greater flexibility in the power of adjustive response is needed, and when this flexibility is possible under the conditions of ganglionic action. But highly complex reflex actions do not inevitably produce reason, and reason can arise in other ways as well.³ And secondary instincts may originate by way of the lapsing of intelligence:

"Intelligent adjustments, when frequently performed by the individual, become automatic, either to the extent of not requiring conscious thought at all, or, as consciously adjustive habits, not requiring the same degree of conscious effort as at first."⁴

These modifications of intelligent adjustment may be transmitted to appear in new generations as instincts. While agreeing with Spencer that on the objective level intelligence is continuous with instinct, Romanes thought there exists a clear distinction on the subjective level. In instinctive process, there is no knowledge of the relation between the means employed and the ends attained, while in rational process, there is such knowledge.⁵

Lewes adopted the view that all instinctive actions are transmitted habits

1. Bastian, H. C.: op. cit., pp.156-7.

2. Romanes, G. J.: Mental Evolution in Animals, p.159.

3. ibid., p.192.319.

4. ibid., p.331 192.

5. ibid., p.331.

from which the intelligence through which they were originally acquired has lapsed. All actions are voluntary in origin, and involuntary ones are acquired by hereditary transmission of modifications they effect, though they remain psychical in nature.

"The peculiarity of Instinct is that although guided by discernment of relations which is intelligent, it is restricted in its pathway and rendered undiscursive by an organized tendency of structure resulting from ancestral restrictions."¹

For writers such as Sully, who retained the tripartite division of mind, instinct and intelligence have separate paths of development, instinct developing with conation and intelligence with cognition. Hobhouse likewise adopted the tripartite division, yet managed to treat instinct and intelligence as continuous stages in the order of mental development.²

C. S. Myers regarded the distinction as not one of origin but of viewpoint:

"Instinct regarded from within becomes intelligence; intelligence regarded from without becomes instinct."³

The question of the relation of instinct and intelligence did tend to become less one of origin, but instead became more one of function. This was Darwin's own emphasis. Spencer had pointed out that intelligent behaviour originates when the instinctive adjustment is inadequate to the demands of a situation of increasing complexity, and in this opinion he was widely followed. Bastian for example wrote:

"While many Instinctive actions are more or less immediate products or resultants, consequent upon the undeviating regularity in the recurrence of Visceral States and impressions and of the sense-guided movements, which they evoke; Reason, Imagination, and Volition, on the other hand, as mere higher developments arising out of previous processes, have their seed-time in all that is unfamiliar among the chance Sensorial Impressions which Animals, whose 'experience' is growing and whose Nervous Systems are developing, are accustomed at intervals to receive from the outer world."⁴

1. Lewes, G. H.: Problems of Life and Mind, 1st series, vol. 1, p.228.

2. Hobhouse, L. T.: Mind in Evolution, pp.62, 99.

3. Myers, C. S.: Symposium in Br. J. Psychol., vol. 3, part 3, p.218.

4. Bastian, H. C.: op. cit., pp.252-3.

The idea arose independently that intelligent function replaces, rather than supplements, instinctive. As early as 1874 Carpenter suggested this, when he commented that in Man, secondarily-automatic modes of movement that have developed in the course of self-education, replace modes that are congenital in most of the lower animals.¹ Carpenter believed that instinct culminates in the articulated series, intelligence in the vertebrates.² In 1900, Lankester adduced evidence from comparative anatomy to prove that the neural functions of intelligence and instinct are antagonistic. Pointing to the increased size of the cerebrum correlative with mental development, he concluded that "educability" is a function of size. Educability enables the individual to acquire modes of behaviour (and neural mechanisms) related to his particular needs, whereas the nerve-mechanisms of instinct are transmitted by inheritance after arising by a slow process of natural selection over preceding generations. Lankester decided that:

"there is no community between the mechanisms of instinct and the mechanisms of intelligence, and that the latter are later in the history of the development of the brain than the former, and can only develop in proportion as the former become feeble and defective."³

Morgan readily adopted this biological view. In Animal Behaviour, he explained that the evolution of intelligence parallels that of plastic behaviour necessitated by a complex environment, whereas instinctive and stereotyped behaviour is sufficient for a relatively constant environment. Further, stereotyped adaptation can never develop into plastic accommodation; their lines of evolution are separate, though they interact in the individual and in the process of evolution.⁴ In practice, instinct and intelligence can be separated only in the very first instinctive act ; after the first experience, an instinctive act will be (intelligently) assimilated to previous experience.⁵

1. Carpenter, W. B.: op. cit., p.342.

2. ibid., p.57.

3. Lankester, E. R.: op. cit., pp.624-5.

4. Pp. 172-3.

5. Morgan, C. L.: Symposium in Br. J. Psychol., vol. 3, pp.219-229.

In the Symposium on "Instinct and Intelligence" in the British Journal of Psychology of 1910, three out of the five contributors were agreed that intelligent behaviour develops at the expense of instinctive - Morgan, Carr and McDougall. For McDougall, however, such development occurs only in the individual. He treated instinct as a "psycho-physical disposition" with a cognitive as well as a neural aspect. Unlike Morgan, he did not suppose that man begins life with fewer instincts and more "educability" than the lower animals, but that he begins with many of them; instincts are the prime movers of all activity, though in man they are more susceptible to intelligent modification by experience than in the lower animals. As most instincts ripen fairly late in the individual development, their motor tendencies are from the first modified, controlled and suppressed in various ways.

Increased plasticity of behaviour, or modifiability of instinctive patterns, obviously could not result from the inheritance of functionally acquired structural modifications. Offspring could only inherit the capacity which made such acquisitions possible. So that natural selection was the sole causal process implied or discussed by writers who held opinions like Lankester's.

OBSERVABLE STAGES IN MENTAL DEVELOPMENT

While some writers plotted the complete course of mental development, others selected various stages along this course for particular study. A number of independent fields of research expanded - in the psychology of animals, of children, of earlier and primitive societies, and to a small extent of the insane. This research was motivated firstly by an interest in the different stages of mental evolution for their own sake, and secondly by a fairly widespread acceptance of the recapitulation theory of human mental development - that the individual mind in the course of maturation passes through stages parallel to those passed through

by its ancestors in the course of evolution. It has been seen that Stout, for one, assumed this recapitulation theory, when he illustrated stages in the course of human mental development with examples from primitive races and animals.

Sully in 1892 pointed out that:

"The newest developments of psychological method lay thus on a wide objective comparison of psychical phenomena as a basis of sound scientific induction."¹

During most of the period from 1858 to 1910, the comparison of the mental states of animals was closely tied up with the endeavour to demonstrate the fact of mental evolution.² During the 1850's, a certain amount of material on animal mental process was produced to demonstrate the continuity of the animal mind with the mind of man. Darwin's work on The Expression of the Emotions in Man and Animals in 1872 seemed to have no ulterior motive behind its concern with an area of comparative psychology. At about the same time Douglas Spalding began experimental researches into the highly refined and complex adjustments manifested by the newly-born of higher animals, especially chicks,³ while John Lubbock⁴ proceeded to observe and manipulate the behaviour of social insects.⁵ Lubbock came to the conclusion that the social organization of such insects indicates a high degree of intelligence, though he could find no evidence for the existence of communication between them. In 1879 C. Grant Allen published a book on The Colour-Sense: its origin and development - an essay in comparative psychology, in which he considered the evidence for the perception and appreciation of colour in classes of lower animals. Romanes followed in 1882 with Animal Intelligence, and in 1883 with Mental Evolution in Animals. Morgan's series of books in the area (Animal Life and Intelligence, An Introduction to Comparative Psychology,

1. Sully, J.: op. cit., p. 27, vol. 1.

2. The topic has been treated elsewhere, so will be considered here in brief.

3. Published in MacMillan's Mag., 1873, 27, pp.282-293.

4. LUBBOCK, Sir John, Lord AVEBURY: 1834-1913.

5. Scientific Lectures, 1879; Fifty Years of Science, 1882; Ants, Bees and Wasps, 1882.

Habit and Instinct, Animal Behaviour) appeared between 1890 and 1900.

Much of the evidence presented by these early writers was anecdotal in nature, and tended to maximize the degree of animal intelligence. Incidents quoted usually related to the cleverness of animals in natural or artificial environments, their powers of imitation (and thus of inference), of intercommunication, and of emotional reaction suggesting a rudimentary conscience. But even Romanes laid down strict criteria for the selection of anecdotes, and for the inferring of mind - whether the organism learns to make new adjustments or to modify old ones, in accordance with the results of its own individual experience. Morgan adopted this as the criterion of consciousness, and the presence of discrimination as that of mind. To offset the anthropomorphic tendency Morgan introduced his canon, and made his own observations, by manipulating the conditions of the animals' usual environment. Generally the comparative psychologists depended on the older associationist psychology for their classificatory terms.

More important than the actual work done in comparative psychology was the appreciation of its position and techniques. Examples from the area were frequently used by writers on general psychology - to illustrate stages in human mental development (as by Stout), to highlight aspects of human mental process (as by McDougall), and to clarify the nature of processes complicated in man by experience and higher intelligence (recommended by Morell¹). The approach to methodology of the subject gradually changed. Romanes considered we can only argue from analogy with human mental process, though he realized the difficulties of so doing:

"The mental states of an insect may be widely different from those of a man, and yet most probably the nearest conception that we can form of their true nature is that which we form by assimilating them to the

1. Morell, J. D.: op. cit., p.22.

pattern of the only mental states with which we are acquainted."¹

But Morgan pointed out that comparative psychology must rely on a study of comparative physiology of the central nervous system and of corresponding adjustive actions.² Then we must study human mental process, and proceed by inference.³

On this method, Morgan judged the level of intelligence by complexity of adjustments made, their precision, rapidity, degree of adaptiveness, and the prevision shown.⁴ Pearson limited the method of inference from human to animal mental

processes to animals with nervous systems akin to our own.⁵ Lewes however consid-

ered that all nervous systems are fundamentally alike in structure and physiological function - so the mental functions of all organisms with nervous centres

are comparable too. The functions of the bee bear a basic resemblance to our own.⁶

"By employing the general term Sensibility to designate the whole range of reactions peculiar to the nerve-centres, when these special organs exist, it will be possible to interpret all the physiological and psychological phenomena observed in animals on one uniform method. The observed variations will then be referable to varieties in organisms."⁷

It is apparent that the extension of comparative psychology required an emphasis on the functional aspect of mind in relation to the organism, or its nervous system.

The study of the child mind had been recommended by various writers on psychology, such as Reid and J. S. Mill, before the theory of mental evolution became current, as being likely to throw light on the complex processes of the adult mind, but had not been undertaken. Darwin in 1877 published "A biographical sketch of an infant" in Mind, after which a number of writers on mental evolution included in their accounts of the development of mind in general brief and frequently speculative accounts of the development of the mind in the individual

-
1. Romanes, G. J.: Animal Intelligence, p.10.
 2. Morgan, C. L.: The Springs of Conduct, p.165.
 3. Morgan, C. L.: Animal Behaviour, p.50.
 4. Morgan, C. L.: Animal Life and Intelligence, p.462.
 5. Pearson, K.: op. cit., p.58.
 6. Lewes, G. H.: The Physical Basis of Mind, p.362.
 7. ibid., p.198.

during childhood. The reasons for so doing were again various. Sometimes the account was intended to demonstrate the fundamental nature of human mental processes before being overlaid by experience - McDougall used evidence from child behaviour to locate the primary instincts and emotions.¹ Sometimes an account of child development was included just as part of a general view of mental process and development, without any particular significance for any other area than its own. (Stout for instance in his Groundwork of Psychology included such a brief description, in no way integral to the book.) At other times the process of child development was treated just as the preliminary to adult mentality (Morgan described how the adult stage of deliberate imitation is reached by the child through instinctive imitation followed by intelligent imitation which involves profiting by chance experience²). Only by Sully did the field receive detailed treatment in its own right, as a stage in the development of mind - in 1896 he published Studies of Childhood abbreviated in 1897 in Children's Ways.

A prevalent attitude to the mental development of the child was that it recapitulates the whole history of its ancestral mental evolution writ small. Those who advanced this view usually utilized instances from child development to fill in gaps in their supposed knowledge of mental evolution, or to illustrate certain aspects of it in detail. Such a proponent was Romanes:

"So long as (human intelligence) is passing through the lower phases of that development, it assuredly ascends through a scale of mental faculties which are *pari passu* identical with those that are permanently presented by the psychological species of the animal kingdom."³

1. For example, the fear-exciting powers of the unknown may be located in this episode:- "A courageous child of five years, sitting alone in a sunlit room, suddenly screams in terror, and, on her father hastening to her, can only explain that she saw something move. The discovery of a mouse in the corner of the room at once explains and banishes her fear, for she is on friendly terms with mice." (An Introduction to Social Psychology, pp.46-7)
2. Morgan, C. L.: Animal Behaviour, p.192.
3. Romanes, G. J.: Essays, "Man and brute," p.62.

Likewise Lewes:

"We know that the mental development of a civilized man passes through the stages which the race passed through in the course of its long history, and the psychology of the child reproduces the psychology of the savage."¹

The recapitulation theory was also applied in the area of mental pathology, which began to flourish, partly because of this locating of the area in the range of mental evolution, and partly² as a result of a stimulated interest in the study of individual differences and of mental physiology. Maudsley pointed out that when the human brain is arrested in the course of development it displays functions appropriate to that stage of development in the animal kingdom, and conveniently attributed the phenomenon of mental regression to a reversion to an earlier stage in the development of the race.³ Charles Mercier adopted a more specifically Spencerian approach; sanity is defined as adjustment of mental relations to the environmental relations with which they correspond, and insanity as maladjustment of the same.⁴ This type of evolutionary interpretation of pathological states became popular on a general level; even Pearson considered that some types of idiocy may be a return to a state where the perceptive and reasoning faculties are not co-ordinated.⁵ A theologian, Henry Drummond, wrote:

"When the Mind is affected by certain diseases, its progress downward can often be followed step by step. It does not tumble down in a moment like a house of cards, but in a definite order, stone by stone, or storey by storey. Now the striking thing about that order is that it is the probable order in which the building has gone up."

Recapitulation theory could not be applied to social psychology, as a society, unlike an organism, has no ancestors. But the view was advanced by Lewes, Sully and others that the development of the civilized man recapitulates that of his whole society or race, or at least that a knowledge of the processes

-
1. Lewes, G. H.: op. cit., p.87.
 2. V. Ch. 5.
 3. Maudsley, H.; Body and Mind, pp.49-52.
 4. Mercier, C.: The Nervous System and the Mind, pp.250-1.
 5. Pearson, K.: op. cit., p.104.
 6. Drummond, H.: The Ascent of Man, p.172.

of social evolution and historical progress is necessary for an understanding of the manner of influence they exert on the growth of an individual mind.¹ It was further assumed that the development of all societies or civilizations follows the same pattern, though no-one quite succeeded in determining what this pattern is, so that if information on the past evolution of civilized societies is unavailable, reference may be made to contemporary primitive cultures. Partly because of its bearing on the individual man, and partly because the development of society was regarded as an integral part of the evolution of man, psychologists began to refer to the comparative study of societies and their development.

Spencer pioneered the evolutionary approach to the study of civilization,, although the question of social "progress" had received attention long before. In 1848 he published Social Statics, in which he argued that Man has been, and is, undergoing modifications of nature which fit him for the social state, by making conformity to the conditions spontaneous. This process was explained by the principle of the inheritance of acquired habits. In 1857 in an essay on Progress: its law and cause, he described how in the course of social evolution increased differentiation of the social structure takes place.² In 1860 he published The Social Organism, an essay drawing a detailed analogy between the structure, functions and course of development of the individual organism and society.³ This analogy facilitated the application of evolution theory to "super-organic" structure, and briefly enjoyed wide popularity. The Principles of Sociology appeared in 1876; here Spencer made it clear that he was treating the topic as a branch of natural science. ~~Althe~~ The principle of natural selection was liberally applied here - to explain the origin of sociality (which would tend to preserve individuals although opposed to their personal inclination), the domination and extermination of inferior races by superior ones, and the correlation between

1. Sully, J.: op. cit., vol. 1, pp.33f.

2. & 3. Spencer, H.: Essays, vol. 1, nos. 1 and 10.

barbarism, small size and defective legs.¹ On the basis of his description of mental evolution in the Principles of Psychology, Spencer described the expected qualities of the primitive man, which he duly located.²

In the 1840's considerable interest was displayed in primitive and savage races. This interest was dominated by a concern with current social, political and legal institutions. After about 1870, the study of institutions, customs and their development began to flourish in its own right. Whether this change was a direct or indirect result of the work of Darwin or of Spencer is a question which would require lengthy discussion. Certainly much of the work appeared before Spencer published his major work on sociology. Here all that is adduced is that the change did occur, that psychologists recognized the relevance of this new material to their own revised conceptions, and that the evolutionist emphasis at least displayed itself throughout these studies of civilization, whether or not it prompted them.

For instance, in 1870 Lubbock published The Origin of Civilization and the Primitive Condition of Man, wherein he claimed that the study of the social and mental condition of savages, their customs, language and art, is important because in many ways these primitive races resemble our own ancestors. The same view was very forcibly asserted by McLennan in 1876, in Studies in Ancient History. McLennan argued that development of all human powers and habits is regulated by the same general law, and that it is therefore necessary to show how inequality in rates of social development can produce the existing diversity of social

1. Spencer, H.: Principles of Sociology, vol. 1, pp.43-7.

2. The primitive man is wanting in the most complex emotions that correspond to multitudinous and remote probabilities; his consciousness consists largely of sensations and the simplest representative feelings directly located with them; his mind is thus marked by "more of that irregularity which results when each desire as it arises discharges itself in action before counter-desires have been awakened. He lacks general ideas, recognition of long sequences, modifiability of belief, abstract ideas, constructive imagination, definiteness of thought, and the conception of uniformity in the order of phenomena. (*ibid.*, pp.61, 84-6).

forms. E. B. Tylor in 1871 (Primitive Culture) declared that our best means of tracing the course of civilization is to compare existing races, which he did. The various grades, he said, may be viewed as stages of evolution. At the same time, the same customs may arise independently among different groups. His particular thesis concerned the evolution of religion from certain aspects of primitive ~~cul-~~ mentality. In 1883 H. S. Maine sought in his Dissertations on Early Law and Custom for the absolute origin of our modern legal system. Where archaeological evidence was scanty, he considered studies of the animal world.

Benjamin Kidd in 1894 described the course of social evolution in terms of a conflict between natural selection, which tends to evolve a religious character as the result of subordination of individual interests, and the development of individual reason. (Spencer said the interests and development of the individual are gradually merged with social ones.) In 1898 W. H. Mallock in Aristocracy and Evolution attributed social evolution to the survival of the fittest, and more particularly to the political efforts of "the great man."

The data provided by these writers was thus in suitable form for the psychologists concerned rather with the evolution of the individual mind, and they often drew upon it, or at least mentioned the desirability of so doing. The question of social development was a crucial one for other reasons, for an overwhelming majority of psychologists agreed that man's superiority over animals lies somewhere in the social factor. Those who concerned themselves mainly with the history of civilization tended to view social progress (variously defined) as the goal of all evolution, while those concerned with other areas of psychology or mental evolution in general viewed social progress as a means to further development of the individual mind.

In The Descent of Man, Darwin assigned an important role to society in the evolution of the intellectual faculties, which would be much aided and modified

through imitation. Habitual imitation and practice of each new art "must in some slight degree strengthen the intellect."¹ In the second edition of Principles of Psychology, Spencer ascribed the organization of general ideas in human beings to their social condition. As social conditions render experiences more multitudinous and varied, abstract thought, the notion of uniformity, definiteness of thought and imagination are rendered possible.²

The important role of social life was rapidly narrowed down by others to the sphere of language. Lewes considered that psychology must take as much account of the social medium as of the biological organism, and social evolution:

"rests on the evolution of Language, as a means of symbolical expression rising out of the animal function of individual expression by the stimulus of collective needs."³

The individual man, of course, would not bother to fashion his feelings, thoughts and volitions into conceptions, were it not for the community, nor to verbalize them. The animal, then, lacks the power of conception or thought. He also lacks the extensive range of knowledge transmitted to man from the accumulated experience of his ancestors - not through inherited structural modification (too slow), but through the written records of society. He can only group feelings - that is, he has only a Logic of Feeling, and not a Logic of Signs; man has both. The Logic of Signs develops out of the Logic of Feelings through language, which communicates knowledge of objects as well as feeling.

Whether the Logic of Signs or the knowledge of objects (in abstraction, self-consciousness, naming, etc. - the line of demarcation was variously drawn) comes first was a matter not clear in the writings (and probably the minds) of many psychologists. But whichever was given priority, as both are so closely related, the study of language was seen to provide fruitful evidence of the course of mental development.

The extent to which animals can communicate was of course much discussed -

by Lubbock, Romanes, Morgan and others. The usual conclusion reached was that reached by Lewes - that animals only communicate feeling. Romanes however concluded that animals are capable of rudimentary generalizations or "recepts" - a combining of simple ideas. When man deliberately gives these recepts a name, he is conceptualizing. The crucial difference between these processes lies in conceptual self-consciousness, "the introspective recognition of self as an object of knowledge."¹ But the only direct evidence of the development of this self-consciousness lies in philology, the study of the structure and development of language. Bastian argued that the use of language by men would:

"proportionately increase the area of their thought-processes, by giving birth to new exercises, or, at all events, by greatly strengthening certain previously embryonic mental processes."²

Morgan, like Lewes, emphasized the importance of social tradition, which, he thought, develops from imitation. One characteristic feature of human progress he considered to be "the transference of evolution from the organism to the environment, handed on from generation to generation."³ And, he stated, in social communication and consideration of the results of considerable experience, probably lies the key to the transition from perceptual to ideational process. Medlicott explained how language would develop accumulated experience into knowledge, by providing a material notation for the recording of relations. Ward described how language enables us overcome the limitations of our powers of attention, even as regards concrete generic images. With words we can perform operations involving complex presentations, and wait until the conclusion of these operations to realize the result entirely.⁴ Hobhouse pointed to the vast advantage given to man by the provision in language of a store of general ideas at his disposal.⁵

1. Romanes, G. J.: Mental Evolution in Man, p.199.

2. Bastian, H. C.: op. cit., p.415.

3. Morgan, C. L.: Animal Behaviour, p.224.

4. Ward, J.: ibid., pp.75-6.

5. Hobhouse, L. T.: op. cit., p.319.

The result of this enthusiasm over the role of language, either as agent or indicant, was that most writers on mental evolution or genetic psychology - Lewes, Romanes, Hobbhouse, Stout, for example - included in their books a section on language, to illustrate their accounts. The role of Philology as viewed by these writers² was described by Romanes: Philology

"has minutely described the whole of that wondrous aftergrowth of articulate utterance through many lines of divergent evolution, in virtue of which all nations of the earth are now in possession, in one degree or another, of the god-like attributes of reason and of speech."¹

1. Romanes, G. J.: op. cit., p.358.

2. Psychologists made little or no attempt to study language in its own right as part of human behaviour, or to apply to it as a self-sufficient area of growth the laws of evolution. An independent science of Philology had been growing up, however, since Sir William Jones recognized in the late 1780's that resemblances between the Indo-European languages are not due to corruptions of them, but to a common origin and diverging development. In 1861 Max Müller delivered and published a set of Lectures on the Science of Language wherein he described language as "the living and speaking witness of the whole history of our race." (p.27). Müller identified two laws of change in the growth of language - Phonetic Decay and Dialectic Regeneration, and endeavoured to trace this growth back to the primitive elements of language. The first settlement of these roots of language, he decided, would have been followed by a period of free growth, then by a process of natural selection of the most efficient forms. Animals lack the faculty of generalization necessary for language. - This approach showed clearly the influence of Darwin (who later adopted some of Müller's ideas himself), and was strikingly similar in treatment and conclusion to that of the psychologists who (~~probably copying him~~) approached the study of language from the viewpoint of their own subject. It seems probable that Müller's discussion of the comparative vocal and mental powers of animals and men, and his description of language as the witness of the history of the human race, influenced psychologists directly.

The field of psychology expanded enormously after 1858. Quite early in the period it was apparent that psychologists were beginning to draw on a wider field of information than ever before to illuminate their study of mind. As early as 1862 Morell pointed out that the psychologist might usefully make reference to the facts of physiology, insanity, comparative psychology, culture and his own experience.¹ In 1875 appeared the following advertisement in

Nature for the new journal Mind:

"Due prominence will be given in the Review to objective researches into the functions of the nervous system. All special lines of investigation, affecting insight into mind, in dependence on the main track of psychological inquiry, will receive attention in the Review; for example Language, Primitive Culture, Mental Pathology, and Comparative Psychology."²

The "main track of psychological inquiry" should include, according to Bain, the founder of Mind:

"the researches into the brain and nerves that deal with mental function; the experiments on the senses having reference to our sensations; the whole of the present mathematics of men, bodily and mental; the still more advanced inquiries relating to our intelligence; and the nature of emotion as illustrated by expression."³

These areas of physiological psychology and the systematic study of individual differences will be considered in the following two chapters.

-
1. Morell, J. D.: op. cit., p.22.
 2. Nature, vol. xi, 11/2/75, p.294.
 3. Bain, A.: Dissertations, p.267.

MIND AS FUNCTION

Darwin treated mind as a function of the organism in the sense that, if behaviour (and mind he treated as behaviour) was ~~not~~ adaptive, the organism would not survive. This aspect was not particularly prominent in his work, for his emphasis in accounting for the evolution of mental process lay not on the principle of natural selection, but on that of the inheritance of acquired modifications. It is argued here that for some psychologists of the period this approach originated independently in physiology, and just conveniently coincided with evolution theory.

The question of the relationship of mind to body was a crucial one for the theory of mental evolution. While on a metaphysical level the usual attitude adopted by supporters of mental evolution was that the mind-body relation is a parallelism, or one of aspects of the same underlying existence, the more physiologically-minded of the psychologists came at the same time to treat mind as a function of the organism. Very few were consistent in such treatment throughout all their works. But the approach fitted in very well with the theory of mental evolution. From the establishment of evolution of the organism, the evolution of its function was a logical deduction. Whether, ultimately, causal priority was assigned to the body or to the mind, or to neither, made no practical difference whatsoever to this treatment of mind.

The early associationists were concerned solely with the data of consciousness. Phrenologists, though they relied on the data of introspection and on very crude observation of the brain and skull, propagated the belief that the brain is the seat of mind and temperament. Bain and Spencer each developed parallel systems of physiology and psychology, drawing on one class of facts to cover over any gaps in the other. Spencer explained that information about the nervous system is just the data of psychology, not the subject itself.

Psychology is "the relation between a neural process and a feeling when regarded in connection with some existence lying outside the organism."¹

During the period under consideration, however, a number of writers — Lewes, Carpenter, Maudsley, Bastian, Mercier — argued for various reasons that physiological inquiry is an indispensable and primary method of psychology. Others, like Morgan and Sully, took the attitude that where direct or reliable knowledge of psychical process is inaccessible, we must supplement and correct inference by physiological investigation. But towards the end of the period, the interest of many English writers in physiological psychology was definitely fading (McDougall being a notable exception in this respect). Stout claimed that, even if we did know more physiology than we do, that:

"If the course of mental events is not regulated by discoverable uniformities capable of being interconnected so as to form a coherent system, the psychologist has nothing to do."²

Bain fairly accurately summarized the physiological knowledge of his time. The work of Bichat, Rolando and especially Flourens in the late eighteenth and early nineteenth centuries had served to localize the general functions of perception, co-ordination, conservation and conduction in the cerebrum, cerebellum, medulla oblongata and spinal cord respectively. During the nineteenth century developments in the study of histology of the nervous system implied that further localization of mental functions could be performed. Between 1860 and 1900, speech, motor and sensory centres were located. In 1811 Bell, and in 1822 Magendie, established the anatomical distinction between sensory and motor nerves, thus laying a firm foundation for the doctrine of reflex action. The view of the vast majority of physiologists and psychologists — Hartley, Gall and Flourens among the early ones; Romanes, Brodie and Schafer among the later ones — was that the brain is the exclusive seat of mind, or consciousness. The increasing

1. Spencer, H.: Principles of Psychology, 2nd edn., vol. 1, p.128.

2. Stout, G. F.: Manual of Psychology p.4.

practice of separating mind from consciousness made the location of both more of a problem. (This practice was indulged in by comparative psychologists, such as Morgan, who argued that though lower animals may make adjustments indicative of mentality, consciousness of such adjustment is an epiphenomenon probably occurring late in the course of evolution. Other writers, such as Bastian, began to argue that as ideas and images can pass in and out of memory and the field of attention, consciousness should be included within mind, and not be treated as co-extensive with it.)

Carpenter located consciousness in the basal ganglia, instead of in the cerebrum, and said there occurs "unconscious cerebration." In 1854 Carpenter based his belief in the continuity of psychical process throughout the animal kingdom on the comparison of the nervous system of different species. The purpose of the nervous system, he said, is to serve as an instrument of psychical process. In 1874 he refined this approach: automatic mental activities are caused by nervous action, but voluntary processes just work by means of it. Although Carpenter insisted that Principles of Mental Physiology was not a psychological treatise, he studied mind by way of nervous action. For instance:

"The judgment of Common-Sense as to any 'self-evident' truth, may be defined as the immediate or instinctive response that is given (in Psychological language) by the automatic action of the mind, or (in Physiological language) by the reflex action of the brain, to any question which can be answered by such a direct appeal."

Bastian in 1885 pointed out that knowledge of mind may be derived by introspection, by inference from behaviour, or from neurology. In adopting the latter approach he treated the brain as the chief organ of mind. (Despite the title of his work, The Brain as an Organ of Mind, Bastian objected to the view that the mind uses the nervous system as an instrument.) Mind, viewed physiologically, includes the functional results of all nerve actions on the side of ingoing

currents and in the nerve centres, whether conscious or not.¹ In support of this attitude, he pointed to the established correlation between different mental processes and brain areas, and the invariable dependence of mental phenomena on neural properties and structure. Further, discrimination is the basis of mind,

"and it seems to result from the very nature of nerve tissues and their mode of development, that variations in the kind and combination of impressions acting upon any particular organism as part of its life phenomena, become by slow degrees organically linked to different and severally appropriate motor results,"

-- and thus the nervous system discriminates.² In particular, ^{unconscious} processes which often form intermediate links in mental processes may only be adequately studied on such a definition. Conscious process, viewed from an evolutionary viewpoint, is just more complex unconscious process -- and the genetic study of mind must include both.

Bastian was prepared to compromise, and to utilize the data of introspection and inference too. For Maudsley the physiological approach was all-important. Maudsley believed that "mental power exists in statical equilibrium as well as in manifested energy;" consciousness can give no account of the former --

"but as statical mind is in reality the statical condition of the nervous substrata which minister to its manifestations, it is plain that, if we ever are to know anything of mental organization, it is to the progress of physiology that we must look for information."³

Consciousness reveals nothing of the process by which association or generalization of ideas takes place, nor of the effect on mind of disturbance in other bodily organs. Mind is therefore most adequately described as a function of the organism ^{from} -- and Maudsley presented data ~~for~~ comparative physiology and psychology, plus that concerning the localization of mental functions in the brain, to prove that it is indeed such a function. On this approach, a man's temperament was interpreted

1. Bastian, H. C.: op. cit., p.148.

2. ibid., pp.156-7.

3. Maudsley, H.: op. cit., p.29.

as "the expression of the entire constitution of his body,"¹ volitional action as "fundamentally a reflex or excito-motor process in which a cerebral mechanism of extreme delicacy and intricate complexity of construction, embodying past experiences in its structure, intervenes between the ingoing stimulus and the outgoing movement,"² language as "the highest display of reflex function,"³ and insanity as disorder of the hemispherical ganglia,⁴ defective development, or "dissolution of function of the confederate centres."⁵

In 1855 Noble defined insanity as "apyrexial disorder of the brain,"⁶ and pointed out that mental processes correlate with localized brain processes. Mercier in 1888 likewise stressed the functional dependence of mind and behaviour on the constitution of the nervous system, defining psychology as the study of Nervous Processes, Conduct and Mind, Insanity being disorder of all three. "States of mind are but the obverse side, or the shadows of nervous processes."⁷ Mercier's treatment of mind as function was however only spasmodic.

In the eighteenth century, Robert Whytt and Prochaska had viewed sensibility as being common to the whole cerebro-spinal axis. In 1832 Marshall Hall declared a distinction between voluntary and involuntary action, thus sparking off the controversy as to whether the spinal reflex is conscious. The general opinion in Britain was that it is not. In 1844 Thomas Laycock presented the British Association with evidence for the existence of cerebral reflexes, saying that the action of the spinal cord must not be separated from that of the brain. He was, he wrote:

"led to this opinion by the general principle that the ganglia within the cranium being a continuation of the spinal cord, must necessarily be regulated as to their reaction on external agencies by laws identical with those governing the spinal ganglia and their analogues in the lower animals. If, therefore, the spinal cord is a centre of reflexion, the

1, 2, 3. ibid., pp.361, 441, 505.

4. Maudsley, H.: Body and Mind, p.22.

5. Maudsley, H.: Natural Causes and Supernatural Seemings, p.168.

6. Noble, D.: op. cit., p.11.

7. Mercier, C.: Sanity and Insanity, p.57.

brain must also be one."¹

Laycock however did not extend this community of function as far as community of property. Lewes set about to remedy the omission. In 1858 he discussed² the similarity before and after decapitation in performance of an irritated newt, and concluded that either both or neither sets of responses must be conscious. In 1859, in The Physiology of Common Life, he declared his intention of studying the nervous system in toto - since there are other centres of sensation and volition besides the brain. The unity of the nervous system throughout the animal kingdom must, he said, denote unity of consciousness. On a physiological level, then, Lewes was unquestionably treating consciousness as a function of the nervous system.

Between 1874 and 1879, Lewes expanded these views into a system, Problems of Life and Mind. By this stage he had accepted the doctrine of the inheritance of acquired characteristics, earlier rejected, and the principle of natural selection. The subject-matter of psychology he defined as "experience,"³ but the fact that consciousness tells us nothing of its dependence on mental states is the very reason physiological data relating to such dependence cannot be ignored.⁴ This inclusion of physiological data is quite permissible on the basis of the dual-aspects theory. Though chiefly physiology deals with the objective aspect, and psychology with the subjective, treatment of the objective aspect provides a basis essential to psychology:

"Physiology must trace for us the organic conditions of the observed phenomena, explaining the sentient functions by the sentient mechanism. It must study man first as an animal. Psychology, receiving from the hands of Physiology a theory of the mechanism, must from Observation and History trace the operation of this mechanism in the functions and faculties which spring into existence through its adaptation to the Cosmos and Society. It must study man as a social animal."⁵

1. Quoted Lewes, G. H.: op. cit., p.453.

2. Report of Br. Assen., 1858, pp.135-8.

3. Lewes, G. H.: The Study of Psychology, p.90; 5. - p.38.

4. Lewes, G. H.: Foundations of a Creed, p.126.

We have sensations and emotions when the sentient mechanism is set in action, and experiences when these leave behind them traces in our constitution. So psychology considers the human mind "as a product of the Human Organism not only in relation to the Cosmos, but also in relation to Society."¹ Now the inseparable kinship of mental with vital phenomena is marked by the physical attribute of Sensibility, the property of excitability of nervous tissue, Sensibility in its subjective aspect is sentience. There are a number of laws of operation of Sensibility, one of which is that by differentiation of tissue, the sentient organism adapts itself to the external medium. While the whole organism is sentient, the nervous system is the dominant agent in sentient processes; in the nervous system, sensibility is the property of combining and grouping stimulations. Functions of the nervous system are excitation of the tissues, and co-ordination of the energies thus released. Throughout the animal kingdom, nervous systems are basically alike in structure, property and function - though their functional relations depend on their anatomical connections. All central action, cerebral as well as spinal, was viewed by Lewes as being reflex in character - and all reflex action involves ~~some~~ sentience. (The evidence adduced for this view was - the absence of anatomical evidence for the simple reflex arc, the demonstration of certain modes of sensibility by decapitated animals, the similarity in structure of nervous tissues in the brain and spinal cord.) All actions begin by being voluntary and intelligent and conscious; with practice (either in the individual or the race) the physiological disposition of the nervous substance may change, and irradiation resulting from certain stimuli be restricted to certain paths. So-called "automatic" or unconscious action occurs when such restriction is complete.

1. ibid., p.5.

As all action of the nervous system is reflex action, or grouping, differentiation of the nervous system will result in more complex processes of grouping. In ascending stages, these processes may be described as the logic of feeling, the logic of images, and the logic of signs. But as these are all developed from one basic process in one vital tissue, there is basically no distinction between them. Like Bain then, Lewes stressed the genetic identity of sensation and thought - and included volition. On the view outlined, all physiological and psychological processes observed in animals and man may be interpreted on one uniform method.

The implications of Lewes' views for mental evolution were obvious:

"The anatomist having traced a community of plan in the composition of organisms, and the physiologist having traced a corresponding community of function, so that the animal series come to be viewed as a gradual differentiation of simpler into more complex forms, and the ~~the~~ complex thus become intelligible in the light of the simpler forms, the psychologist readily concluded that since the mental functions were organic functions, they also might profitably be studied on the comparative method. All those animals that possessed a nervous system would necessarily present the sentient functions of that system; the system in its simpler forms would present the functions in simpler forms."¹

Since sensibility is a property of all living tissue, the problem of accounting for its origin was removed. Yet this belief did not result primarily from the dual-aspects view, but from the view of mind as organic function. Morgan's similar metaphysical stand led him to believe that even inorganic life has its infraconscious aspect - but Lewes' approach did not take him below the simplest living organism.

Even before evolutionary theory became popular, then, and because for various reasons it was realized that the data of physiology were useful or indispensable to psychology, a few writers were treating mental process as a function of the organism.

With William James began the massive trend in the United States to function-

1. ibid., p.123.

alism, by which mental activity was assessed in terms of use to the organism and contribution to its survival. Although functionalism in Britain never approached the status of a school, the outlines of the notion were to be found in the writings of a number of evolution-minded psychologists between 1858 and 1910.

Hobhouse for instance decided that as the mental states of animals are inaccessible, it is most appropriate to talk in terms of function:

"If the behaviour of another being corresponds precisely in all its outer relations to that which I know of in myself as carried out in consciousness and never without consciousness, it is clear that in the other being some process occurs which performs the same functions as consciousness performs in me The organization of the animal being different, it is possible that the state of consciousness may differ in any respect not essential to its function."¹

McDougall considered that "the static, descriptive, purely analytic psychology must give place to a dynamic, functional, voluntaristic view of mind."² Ward in 1904 wrote that the emphasis in psychology was now on will and activity:

"Psychologically regarded, then, the sole function of perception and intellection is, it is contended, to guide action and subserve volition - more generally to promote self-conservation and betterment."³

The influence of the theory of natural selection may be traced more specifically. One rather crude application of the principle was the endowment of the organism with the purpose of continuing its species. So Charles Mercier wrote that all living beings have a conscious desire for whatever is directed to that end, and an aversion for whatever is directed against it.⁴ More subtly, the theory of natural selection led to an emphasis on mind as adaptive process. Hobhouse, for instance, described the progression from stage to stage of intellectual development as successive adaptations. Lankester and Morgan described the course of brain development as decreasing stereotypy of response and as opening

1. Hobhouse, L. T.: op. cit., pp.18-19.

2. McDougall, W. M.: op. cit., p.14.

3. Ward, J.: in Br. J. Psychol., vol. 1, 1904, p.21.

4. Mercier, C.: Psychology, Normal and Morbid, p.6.

the way to increased adaptability of the organism to the environment. Intelligence is thus defined as plasticity of response.

Morgan perpetually talked in terms of functions. The function of consciousness is to drill and organize the active forces of the body;¹ conative tendency secures adjustment to the environment and leads to behaviour;² and "the primary purpose of the evolution of feeling and emotion is to promote beneficial behaviour."³ Romanes described the method of nervous evolution as everywhere consisting "in a progressive development of the power of discriminating between stimuli, combined with the complementary power of adaptive response." Each power, he explained, depends on corresponding development in the other for its own progression.⁴ So the criterion of mind is the extent to which the organism learns to make new adjustments, or to modify old ones, in accordance with experience. Sully considered that mind brings about adjustment to the environment, thus realizing the conditions of preservation.⁵

Spencer's theory of correspondence between internal and external relations had implications for the interpretation of mind not very different from the theory of natural selection. In Darwinian terms, mental process brings about adaptation of behaviour to the environment necessary for survival. In Spencerian terms, mental process just does constantly adjust itself to the environmental situation. But Spencer's descriptive law lacked explanatory power; mind was not itself "adjustive process." It does not appear that any of Spencer's numerous followers made the mistake of viewing it as such. Rather, men such as Lewes, Morgan, Romanes, Sully, Bastian and Maudsley just used the concept of correspondence to describe the course of mental evolution - reference to the environment was thus included without there being required any particular emphasis

1. Morgan, C. L.: Habit and Instinct, p.144.

2,3. Morgan, C. L.: Animal Behaviour, pp.240,294.

4. Romanes, G. J.: op. cit., p.62.

5. Sully, J.: op. cit., vol.1, p.203.

on adaptation and survival value.

During the latter half of the nineteenth century, description of mental process in functional terms was still partly tied down to the philosophical doctrine of hedonism. McDougall in 1908 found it necessary to voice a strong protest against hedonistic explanation.¹ But even he considered that, though pleasure and pain are not in themselves springs of action, they may be the cause of undirected movements.² Bain described the mental state of pleasure as unanalysable; pleasure was supposed to connect itself with vital energy, pain with the opposite.³ Spencer described pleasure and pain as guides to action; the fact that pleasures are incentives to life-supporting acts, and pains deterrents from life-destroying acts is attributed to natural selection.⁴ Romanes wrote that:

"Pains are the subjective concomitants of such organic changes as are harmful to the organism, while Pleasures are the subjective concomitants of such organic changes as are beneficial to the organism - or, we must add, to the species."⁵

Morgan stated that:

"Constituted as we are, we consciously and unconsciously seek pleasure in our actions Pleasure, therefore, as a motive for action, is an important factor in the evolution of a healthy race They in whom pleasure was, and is, joined with abnormal action and 'excess,' are led on to their own destruction; while they in whom pleasure was, and is, wedded to health are preserved in the struggle for existence."

The Basic aims of the organism are self-preservation, and self-betterment as a means to ultimate happiness.⁶

While it was realized by most writers that any association of pleasure with life-preserving activities and of pain with life-destroying activities is founded on experience or on selection of those fitted through such association to survive,

1. McDougall, W. M.: op. cit., p.12.

2. ibid., p.37.

3. Bain, A.: The Emotions and the Will, pp.11-12.

4. Spencer, H.: Principles of Psychology, 2nd edn., vol. 1, pp.231-4.

5. Romanes, G. J.: op. cit., p.106.

6. Morgan, C. L.: The Springs of Conduct, pp.259-60, 287.

pleasure and pain were still frequently treated as motivating powers. A piece of behaviour could then be related to the pleasure or pain it brings to the organism - rather than to its adaptiveness or non-adaptiveness.

It may be concluded that after 1858 there was a tendency in Britain to consider mind as a function of the organism. To a certain extent this may be attributed to the influence of the theory of natural selection. But the issue was somewhat confused by the vestiges of hedonistic interpretation of mental process, and by the correspondence theory offered by Spencer, which accounted for the mind-medium relationship without requiring that the mind be treated in functional terms. A trend in physiological psychology, treating mind as a function without reference to the question of adaptation, had independent origin.

THE MEASUREMENT OF MAN

Outside the work of the physiologists, the individual differences of man were in general not taken into account until the middle of the nineteenth century. Even the early interest in the topic displayed by Galton was chiefly due to the influence of the physiologists.

The period between 1860 and 1880 saw the establishment, as a regular branch, and the inclusion in psychology, of the measurement of man in all its range of variation. In the 1850's the study of individual differences was regarded as a field quite separate from psychology. Thus Darwin wrote that psychology, the science of mental contents, is "the science which investigates the general properties of the human mind," whereas anthropology, the science of mental variation, is "the science of man, in all his variations." It was not until the middle of the nineteenth century that the study of individual differences was included in the domain of psychology.

THE MEASUREMENT OF MAN

Galton, Darwin, and other experimental psychologists have been in their application to human life. Galton, Darwin, and other experimental psychologists have been in their application to human life.

Galton's interest in the measurement of man was not only in the study of individual differences, but also in the study of the general properties of the human mind. Galton's interest in the measurement of man was not only in the study of individual differences, but also in the study of the general properties of the human mind.

Although the most notable figures in the study of individual differences were Galton, Darwin, and other experimental psychologists, the study of individual differences was not only in the study of individual differences, but also in the study of the general properties of the human mind. Galton's interest in the measurement of man was not only in the study of individual differences, but also in the study of the general properties of the human mind.

1. Galton, F. *Hereditary Genius*. London, 1869.
2. Darwin, C. *The Descent of Man, and Selection in Relation to Man*. London, 1871.

THE MEASUREMENT OF MAN

Outside the work of the phrenologists, the individual differences obtaining among men in respect of both physical and mental characteristics received scant attention before 1858. Even the early interest in the topic displayed by Bain was avowedly due to the influence of the phrenologists.

The period between 1860 and 1900 saw the establishment, on a reputable basis, and the inclusion in psychology, of the measurement of man in all his range of variation. In the 1850's the study of individual differences was regarded as a field quite separate from psychology. Thus Morell wrote that psychology, the science of mental constants, is "the science which investigates the essential properties of the human mind," whereas anthropology, the science of mental variables, is "the science of man, in all his natural variations. It deals with the mental peculiarities, which belong specifically to different races, ages, sexes and temperaments, together with the results which follow immediately from them, in their application to human life."¹ But by 1910 the two fields were combined.

C. S. Myers described experimental psychology as being:

"Not engaged merely with general problems It has also to determine how such 'properties' of the mind are affected in any given individual by different conditions, and how far and for what reason they are different in different individuals."²

Although the most notable figure in the area by far was Francis Galton, frequent reference to the existence and study of individual differences was made in the works of the more conservative psychologists who preferred to deal with mental characteristics of man in general, and in non-quantitative terms. In 1885 Bain submitted a paper to the British Association suggesting various lines for researches on bodily and mental characters, which might reflect new light on the

1. Morell, J. D.: Elements of Psychology, pp.1-2.

2. Myers, C. S.: Textbook of Experimental Psychology, p.10.

intellectual constitution of man. (Inquiry into the number and delicacy of the senses of lower animals is, he said, most important as the foundation of every attempt to explain higher aptitudes; the description of exceptional animal performance is not very revealing. In the measurement of human sensations, we must distinguish between powers of discrimination (including threshold, span of attention and memory), and susceptibility to pleasure and pain.) He urged the inclusion of psychology in the anthropological section of the Association.¹ Bain was obviously influenced in his attitude by the theory of mental continuity between species. In 1875 Spencer drew up for the Anthropological Institute of London a provisional Scheme of Character, which presupposed a careful analysis of mind and included an indication of fundamental attributes of man's mental nature, with some mode of measurement. He proposed that the degrees of mental evolution of different human types be studied, taking account of both brain development and complexity of mental manifestation, and including the differences existing between both individuals and races. The evidence for a correlation between the degree of evolution and that of mental modifiability should be assessed. Sex differences and personality should be dealt with partly in relation to living habits and social environment, but largely in relation to the stage of mental evolution they indicate.²

Tylor actually undertook to compare the bodily and temperamental differences of different races, largely through an investigation of their cultures.³

Sully likewise stressed that the psychologist needs to consider modes of variation of mental development. He thought men could be arranged according to their degree of psycho-physical development.⁴ Pathological mental states were coming to be treated as just variations of neural conditions. Mercier agreed that:

1. Bain, A.: "The scope of anthropology," Report of Br. Asscn., 1885, p.1204.

2. Spencer, H.: Essays, vol. 3, no.13.

3. Tylor, E. B.: Anthropology, 1881.

4. Sully, J.: op. cit., vol. 2, pp.299-300.

"There is no phenomenon that can be produced by disease, however bizarre, startling, and marvellous it may appear, which has not its counterpart in little in the healthy organism."¹

Maudsley refused to draw any distinct line of demarcation between sanity and insanity.² But at the same time Mercier defined insanity in terms of non-adjustment of internal to environmental relations, and Maudsley_A described it in terms of regression to an earlier stage of development.

The study of individual differences was thus closely related by some writers to the question of mental evolution - certain people were seen as being less highly evolved than others. In the work of neither Darwin nor of Galton were the individual differences among mankind thus identified with degrees of mental evolution. Rather, they were just the usual range of qualities resulting from multiple reproduction, through simple operation of the (unknown) laws of heredity.

"Variations" in Darwin's usage were the equivalent of innate individual differences, which afford the material for natural selection to act upon and accumulate. Individual differences lie in a continuum with slight and more permanent varieties, sub-species and species.³ Darwin discussed these variations only in a biological context, and concerned himself only with their (biological) origin and fate. The theory of "survival of the fittest" of course raised for him the question of the inheritance of this fitness, which he tentatively answered with his theory of Pangenesis.⁴ Apparently it did not occur to Darwin of his own accord to consider in a similar light current differences of intellect within the evolved human species, although he realized the role of these in the actual process of the evolution of man. In December 1869 he wrote to Galton, commending the latter's recent work on Hereditary Genius, and admitting:

"You have made a convert of an opponent in one sense, for I have always maintained that, excepting fools, men did not differ much in intellect,

1. Mercier, C.: Sanity and Insanity, p.298.

2. Maudsley, H.: Responsibility in Mental Disease, p.38.

3. Darwin, C.: The Origin of Species, vol. 1, p.65.

4. V. p.9.

only in zeal and hard work."¹

Galton also seems to have suggested to Darwin the idea of eugenics, in which humans deliberately speed up the process of natural selection by the selection of favourable variations within their own species to be reproduced.²

Galton then did not get directly from Darwin the idea of measuring the range of human variation. But apparently he logically deduced from the theory of natural selection the idea of the possibility and importance of such research. In his autobiography, he wrote that The Origin of Species inspired him to pursue inquiries which had long interested him, clustering round the issues of heredity and eugenics.³ In his first paper in the area, on "Hereditary talent and character," in 1865, Galton announced:

"I shall treat of man and see what the theory of heredity of variations and the principle of Natural Selection mean when applied to man."⁴

In the preface to Hereditary Genius, he remarked that during an inquiry into the mental peculiarities of various races, the fact of the inheritance of ability forced itself upon his attention. But it seems that his attention was held by this and similar facts by his intense interest in eugenics. In his biography of Galton, Pearson treats this interest as the overriding theme of Galton's work,⁵ and certainly the topic received a mention in practically all of Galton's publications. In the Introduction to Inquiries into Human Faculty and its Development, Galton himself wrote that:

"My general object has been to take note of the varied hereditary faculties of different men, and of the great differences in different families and races, to learn how far history may have shown the practicability of supplanting inefficient human stock by better strains."

In Hereditary Genius the scheme was first elaborated. Galton envisaged a

1. Quoted Galton, F.: Memories of my Life, p.290.

2. V. The Descent of Man, vol. 2, pp.402-3.

3. Galton, F.: op. cit., p.288.

4. MacMillan's Mag., vol. 12, pp.157-661, 318-327.

5. Pearson, K.: Life .. of Francis Galton, vol. 2, p.86.

Utopia, in which year the State would finance the union and undertake to support the progeny of "ten deeply-blushing young men" and ten young ladies, endowed with "grace, beauty, health, good-temper, accomplished housewifery and disengaged affections, in addition to noble qualities of heart and brain." Much of his later work comprised propaganda and data for some such scheme. Galton defined eugenics as "the science which deals with all influences that improve the inborn qualities of a race; also with those that develop them to the utmost advantage."¹ His scheme was intended to work through the establishment of differential rates of reproduction, and not through the elimination by death of the undesirable, and attention was not drawn particularly to those qualities which make for survival. Pearson summarized Galton's achievement thus:

"He was, indeed, the first to grasp that if evolution be the true doctrine of the development of living forms, then it is desirable for rational man to take stock of his varieties, mental and physical, to measure their evolutionary value, and to throw himself into sympathy with the changes Nature foreshadows for his kind!"²

Galton's main problem was to discover the laws by which variations are transmitted by inheritance. Theories of the biological mechanism of descent were rife during the period. While Galton developed one of his own, closely resembling Darwin's theory of Pangenesis, his main concern was the study of the laws of inheritance as manifested in the observable characteristics of the offspring, compared with those of their parents. Maupertius in the eighteenth century had recorded the inheritance of a human trait through several generations, and applied probability laws to his study. Between 1832 and 1848, Quetelet tried to marshal anthropometric measures into such a form as to show the laws governing change with age, and inheritance, in populations. Galton however was the first to apply the normal curve to the study of individual differences, in preparation for the

1. Galton, F.: Essays in Eugenics, p.35.

2. Pearson, K.: op. cit., vol. 2, p.249.

study of their inheritance. Independent developments in statistical theory paved the way for his approach. The normal curve had been defined by De Moivre in 1733, in 1713 Bernoulli published the first book solely on the subject of probability, and between 1800 and 1820 Gauss and Laplace laid the foundation for a theory of errors of observation. By 1830 the mathematical theory of probability was in general use by physicists and astronomers, but had been applied by very few writers to social phenomena. Quetelet stressed the importance of the normal curve, and in 1841 suggested to the British Statistical Association that statistical methods be applied to the investigation of man.

In Hereditary Genius in 1869, Galton considered the inheritance of mental ability, measured in terms of eminent reputation. He realized there might be a distinction between general and special ability, but chose to attribute eminence largely to general ability. He realized also the influence of environmental factors - but argued that "genius" will usually become eminent under any circumstances (a rather inadequate defence of confounded variables). Galton argued that people can be graded for ability in accordance with the normal distribution, but he gave no demonstration of this. He proposed to divide the entire distribution into eighteen classes, making the subdivisions between each approximately equal to the probable error. To demonstrate the inheritance of mental ability, he examined the pedigrees of some thousand "geniuses" from the three top classes, and discovered among their relatives in different degrees of kinship a far higher proportion of eminent men than would be expected on the basis of normal probability. He concluded that the child of able parents has a better chance of being able himself than the child of parents in the medium range.

Most of Galton's work on heredity concerned graded characteristics, though he performed one study on the discontinuous characteristic of eye-colour. As his concern lay only with probabilities of inheritance, he needed to use

measurable characteristics. He sought the laws of inheritance in the amount of family resemblance, and discovered that this amount of resemblance can be measured by a "regression coefficient," the fraction which is constant for all amounts of deviation from the average.

The law of regression discovered by Galton was that the average deviation of the amount of any characteristic from the population mean is less for the offspring than for the parents. Contemplation of this law persuaded Galton that evolution must proceed discontinuously:

"The filial centre falls back further towards mediocrity in a constant proportion to the distance to which the parental centre has deviated from it whether the direction of the deviation be in excess or deficiency. All true variations are (as I maintain) of this kind, and it is in consequence impossible that the natural qualities of a race may be permanently changes through the action of selection upon mere variations. The selection of the most serviceable variations cannot even produce any great degree of artificial and temporary improvement, because an equilibrium between deviation and regression will soon be reached; whereby the best of the offspring will cease to be better than their own sires and dams."¹

As "mere variations" afford insufficient material for natural selection, Galton in 1892 postulated the existence of "sports," which:

"do not blend freely; they are fresh typical centres or sub-species, which suddenly arise we do not yet know through what uncommon concurrence of circumstance, and which observations show to be strongly transmissible by inheritance."²

Galton thus sorted out a certain confusion in Darwin's account of the material on which natural selection operates, without essentially altering the theory. Darwin had said that natural selection operates mainly on "spontaneous variations," and as proof of the existence of such had pointed to the extensive differences ordinarily obtaining within species. Galton pointed out that "spontaneous variations," or the material of natural selection, can not be identified with normal variations.

2. Galton, F.: Finger Prints, p.211.

1. Galton, F.: Natural Inheritance, p.xviii.

In 1886 the concept of regression was further developed by Galton in a number of papers. At about the same time, he was concerned with the problem of measuring the degree of concomitant variation between different bodily characteristics, and in 1888 realized that the problem was likewise one of regression, provided each character was measured in its own variability as unit. The value obtained from expressing both sets of measurements in terms of their average deviation, and calculating the regression, was termed the coefficient of correlation.¹ In Natural Inheritance in 1889, Galton pointed out that the relationship between kinsmen might be measured by this formula. Anthropologists were not immediately impressed by the correlation coefficient; in 1890 it was utilized by Weldon in a study of the organs of shrimps, but it remained for Pearson to popularize the concept by providing a simplified calculation formula (using the method of least squares) in 1895. Galton himself only used the correlation coefficient in connection with hereditary relationship.

Galton's own further work in the field of heredity consisted in a calculation of the contribution of each ancestor to the hereditary endowments of the offspring, a determination of how a population can, under the laws of regression, remain stable, and an investigation into the inheritance of other faculties besides genius - scientific aptitude, artistic faculty, criminality, and various physical attributes. The further work on inheritance carried out at London University was directly inspired by Galton, financially as well as academically. In 1904 he endowed at the University a research fellowship in eugenics, of which Edgar Schuster was the first incumbent. The Francis Galton Laboratory for National Eugenics at University College developed out of this, under the supervision of Pearson and connected with his older Biometric Laboratory. The primary tool of

1. Bravais and J. D. Hamilton Dickson used similar techniques but more cumbersome formulae before Galton, but had not applied them to human measurement.

the researches carried out in the Eugenics Laboratory up to 1910 was the correlation coefficient, which was applied to a wide range of problems relating to eugenics - the inheritance of insanity and academic ability, the effects on the progeny of parental alcoholism, the predictive power of University examination results, the effect of the environment on intellect.

The theory of natural selection thus was responsible for an intensive study of the laws of inheritance, and of the inheritance of mental characteristics. Into this study Galton brought statistical refinements, and in the course of it he modified the definition of "variations" in the theory of natural selection. Out of it arose the question, firstly, of the relative contributions to the individual of heredity and environment; secondly, of the nature and composition of the mental faculties which are inherited and measured, and thirdly, of possible methods of measurement of mental characteristics.

Galton's investigations into the inheritance of mental qualities led him to the conclusion that "nature" is of more significance in development than "nurture." This conclusion he confirmed with a series of studies beginning in 1875 on twins, fraternal and identical, whose history he claimed enables one to distinguish the relative effects of nature and nurture. A method of studying the effects of nurture devised by Galton was the word association test; he considered that the similarity between associations of different individuals reveals a cultural influence. He emphasized the difficulties of the nature-nurture problem, but minimized them in practice.

Galton's direct speculation as to the basic nature of mental qualities ~~and~~ or processes which he measured was not excessive. He suggested, in Hereditary Genius, that ability has both general and specific components - a view utilized later by Spearman. Mainly of importance is the fact that he proceeded in definition by way of experiment. In English Men of Science: Their Nature and Nurture

(1874), he examined the scientific aptitude in detail. On the basis of analysis of responses in questionnaires made by one hundred and eighty "distinguished men of science," he concluded that the scientist is characterized by physical and mental energy, health, perseverance, businesslike habits, memory, independence, and mechanical aptitude. Concerning the nature of general ability, empirical evidence persuaded Galton that discrimination is a good index.¹ Further original inquiries into the nature of mental process were carried out by introspection. For instance, by periodic analysis of his own train of thought Galton decided against free will; by observation of his own mental states after weeks of simulated paranoid behaviour and deification of "Punch," he concluded that paranoia and primitive religious consciousness are induced states of mind.

In his autobiography, Galton explained that, the inheritance of mental qualities once confirmed, he decided to explore the range of human faculty in various directions, in order to ascertain the degree to which breeding might modify the human race. He intended first to "sample" the individual with reasonable completeness, then to establish the combined effect of all faculties in any given proportion, and ultimately to ascertain the predictive power of these measures for "success" in future life.² Galton's main contribution to the science of mental measurement was the application of statistical techniques to the study of individual differences - the extreme of objectifying in psychology. Here his particular contributions were the correlation coefficient, and the use of percentiles for the description of frequencies, and of the quartile deviation for the description of range. In the field of mental measurement also, he emphasized the value of controlled introspection, particularly related to mental imagery and number forms. Concerning mental imagery he drew up questionnaires,

1. Galton, F.: Inquiries, p.20.

2. Galton, F.: Memories of my Life, p.267.

which only loosely restricted the form of the answer; the data thus obtained he classified by non-statistical means, then divided the range of qualities (such as vividness) into octiles.¹ The tools for mental measurement devised by Galton were assorted. To see if differentiated mental characters (racial, criminal, pathological, etc.) have differentiated physical features, Galton constructed composite photographs of personality groups, and considered how well their features harmonized. Other methods proposed for character measurement were physiological reaction to emergencies and small shocks, recorded by cardiographs and pressure-gauges under the subject's chair.

In 1884 Galton opened an Anthropometric Laboratory to collect more data for analysis. Measurements taken were of the body, of sensory and motor capacities, of associative processes (memory, habit formation, imagery, reaction time), and the higher mental processes. Apparatus used included a whistle for determining auditory threshold, a pendulum device for measuring reaction time, a double wedge photometer to test colour perception, and lists of nonsense syllables to test memory span. (Following Jacobs, he found this latter test a good indicant of intelligence.)² The only conclusion of a general nature arrived at by Galton as a result of these Laboratory studies was that men are better than women at everything.

In all main aspects of his work, Galton had many followers. His ideas and techniques spread rapidly outside Britain, and within Britain per medium of Karl Pearson.³ In 1909 an article appeared in the British Journal of Psychology which displayed clearly this extensive influence -- "Experimental tests of general intelligence," by Cyril Burt. Burt raised three main queries regarding general intelligence -- can its presence be detected and its amount measured; can

1. Galton, F.: "Statistics of mental imagery," Mind, vol. x, 1880, pp.301-8.

2. Pearson, K.; op. cit., p.272.

3. The spread of Galton's influence is well outlined by Burt: "Galton's contributions to psychology," Bull. Br. Psychol. Soc., no. 45, 1961, pp.10-21.

its nature be isolated and its meaning analysed; is its development determined primarily by inheritance or by environment. On the whole, it may be said that Galton's statistical techniques had more immediate success in Britain during the period under study than his experimental ones.

Although most of Galton's activities may be traced to the impetus and inspiration of the theory of natural selection, many of his conclusions would probably never have been reached, and the study of the individual man not so soon have achieved the status of a science, had it not been for the use he made of statistical techniques soundly based on work in other fields. Without these statistical developments, the relevance of the study of individual differences and their inheritance to psychology, was still made apparent by Galton's interpretation of the theory of natural selection.

CONCLUSION

C O N C L U S I O N

An examination of the history of psychology between 1858 and 1910 shows the application in the writings of all psychologists of principles which could have been logically deduced from Darwin's theory.

Most in evidence was the theory of mental evolution - that higher mental process has developed naturally out of lower mental process, and is qualitatively continuous with it.

To the adoption of the theory of mental evolution may be directly attributed the enormous expansion of fields of psychology barely opened before - comparative psychology (which fitted in well with comparative anatomy and physiology), genetic or developmental psychology, child psychology, mental pathology, the study of the history of civilization and the comparative psychology of man, and the study of language (already begun by philologists). These areas seemed to develop partly as propaganda for the doctrine of mental evolution, partly because they became of importance in their own right once such a doctrine was accepted. This wider field of study, as well as the wider range of evidence it afforded for the psychology of the adult civilized mind, required more objective methods. The net result of this extension and transformation is usually summarized by historians as the conversion of psychology to a "biological science."

In the discussion of the process of mental development, the two explanatory principles, of natural selection and the inheritance of acquired modifications, were utilized by most psychologists in the early part of the period studied, though after 1890 the Lamarckian hypothesis diminished greatly in popularity. Emphasis on the principle of natural selection produced a certain "functionalist" trend in British psychology, never very conspicuous. More importantly, an analysis of the process of natural selection led directly to the study of human individual differences and their inheritance.

It appears then, that in promoting the acceptance of the theory of evolution and in promulgating the hypothesis of natural selection, that Darwin provided psychology with ideas of enormous significance, the influence of which was in fact universal, and, in the case of many individuals and areas of research, far reaching. Darwin's role however was less straightforward than such an analysis might lead one to support. The notion of organic evolution was held in various forms by numerous scientists for decades before 1858. For all practical purposes Darwin may be regarded as originator of the theory of natural selection, but certainly not of the Lamarckian principle, of which he was by no means the chief exponent in the nineteenth century. For its brief but extensive influence, he cannot be held responsible. The ready acceptance of the theories of evolution and of natural selection suggests that Darwin's personal significance was not great - he was simply the popularizer or agent of ideas in keeping with advances in biology and out of it.

In psychology in the 1850's the idea of mental continuity between species was already current - the influence of comparative physiology as well as psychological observation was conspicuous. A detailed theory explaining this phenomenon was propounded by Spencer in 1855 - but Spencer's work received little attention until publication of the second edition in 1872. The direct influence of certain aspects of Spencer's work on writers after 1872 is quite apparent. It is difficult to distinguish between the respective influences of The Descent of Man⁺ and Principles of Psychology as both appeared simultaneously, and both relied on the Lamarckian hypothesis as well as on the theory of natural selection to explain the process of mental development. But it seems reasonable to attribute the success of Spencer's second edition as compared with lukewarm reception accorded to the first, to the intervening publication in 1858-9 of Darwin's main thesis. - Again Darwin fills the role of popularizer.

Though the theory of organic evolution was very readily applied to mind by psychologists, their means of application differed from Darwin's. They relied on a metaphysical view of the mind-body relationship which easily justified the transition, and which was current before 1858. Darwin's approach to mind as behaviour was adopted by a few writers only because they found it a practical necessity for comparative psychology and for the maximum application to psychology of physiological information.

To an extent, the functionalist treatment of mind in the period after 1858 likewise resulted from a psycho-physiological approach, made attractive by independent advances in physiological knowledge. Independent advances in statistics greatly facilitated the study of individual differences and heredity, giving rise to modifications of the original theory of natural selection.

Only in fairly broad outline then were Darwin's two theories, of descent with modification and natural selection of innate variations of survival-value, adopted and applied by psychologists between 1858 and 1910. Details of the theories were altered or ignored, and Darwin's own application of them to mental process was not copied. The Descent of Man seemed to prompt others to make their own applications, not to elaborate on Darwin's.

Although the patterns of influence of Darwin's broad theories may be easily traced, a consideration of the strands closely interwoven into them from areas outside psychology, of the incipient developments in psychology itself by the mid-nineteenth century, and of the ease and speed with which the theme of mental evolution was absorbed into psychology, detracts from the crucial importance of the solitary event of the publication of his work. The Origin of Species served to combine a number of existing themes. From the point of its publication the field of psychology expanded and altered, in harmony with its own earlier development and external themes.

1910 saw the predominance of a psychology of the James Ward type, which emphasized the unity and activity of mind, replacing the analysis of isolated aspects of experience - a dynamic rather than static conception. Association remained, but no longer as an exclusive principle - evolution theory suggested supplements at a time when prevailing trends in Europe and in British Associationism itself made these appropriate. Approach to the study of psychology in Britain was mainly by way of discussion of mental development and comparison of its stages (although Wundtian techniques appeared towards the turn of the century); in France, on the other hand, it was by way of psychiatric process, and in Germany and the United States by way of experiment and psychophysics. The evidence permits the ascription of this peculiarly British slant to evolution theory.

B I B L I O G R A P H Y

A. PRIMARY SOURCES

1. ALLEN, C.G.F. (1885), Charles Darwin, Longman's, Green & Co., London.
2. ALLEN, C.G.F. (1879), The Colour-Sense: Its Origin and Development. An essay in comparative psychology, Trubner & Co., London.
3. ANONYMOUS (1874), "The development of psychology," Westminster Review, vol. XLV, pp. 377-406.
4. BAIN, A. (1861), On the Study of Character, including an Estimate of Phrenology, Parker, Son, and Brown, London.
5. BAIN, A. (1868), The Senses and the Intellect, 3rd edn., Longman's, Green & Co., London.
6. BAIN, A. (1874), Mind and Body: the theories of their relation, 3rd edn., Henry S. King & Co., London.
7. BAIN, A. (1875), The Emotions and the Will, 3rd edn., Longman's, Green & Co., London.
8. BAIN, A. (1885), "The scope of anthropology, and its relation to the science of mind," Report of Br. Assen., p. 1204.
9. BAIN, A. (1902), Dissertations on Leading Philosophical Topics, Longman's, Green & Co., London.
10. BAIN, A. (1904), Autobiography, Longman's, Green & Co., London.
11. BASTIAN, H. C. (1872), The Beginnings of Life, 2 vols., MacMillan & Co., London.
12. BASTIAN, H. C. (1885), The Brain as an Organ of Mind, 3rd edn., Kegan Paul, Trench & Co., London.
13. BRITISH JOURNAL OF PSYCHOLOGY (1904-1910), Vols. 1, 2, 3.
14. BRODIE, B. C. (1856), Psychological Inquiries: in a series of essays intended to illustrate the mutual relations of the physical organization and the mental faculties, 3rd edn., Longmans, Brown, Green & Longmans, London.
15. BURT, C. (1909), "Experimental tests of general intelligence," Br. J. Psychol., vol. 3, pp. 94-177.

16. BUTLER, S. (1877), Life and Habit, 1910 reprint, A. C. Fifield, London.
17. BUTLER, S. (1887), Luck or Cunning, as the Main Means of Organic Modification? Trubner & Co., London.
18. CALDERWOOD, H. (1879), The Relations of Mind and Brain, MacMillan & Co., London.
19. CALDERWOOD, H. (1896), Evolution and Man's Place in Nature, 2nd edn., MacMillan & Co., London.
20. CARPENTER, W. B. (1854), Principles of Comparative Physiology, John Churchill, London.
21. CARPENTER, W. B. (1874), Principles of Mental Physiology, Henry King & Co., London.
22. CLIFFORD, W. K. (1879), Lectures and Essays, 2 vols., MacMillan & Co., London.
23. CLODD, E. (1903), Pioneers of Evolution from Thales to Huxley, Watts & Co., London.
24. DARWIN, C. (1868), The Variation of Animals and Plants under Domestication, John Murray, London.
25. DARWIN, C. (1871), The Descent of Man, and Selection in Relation to Sex, 2 vols., John Murray, London.
26. DARWIN, C. (1872), The Expression of the Emotions in Man and Animals, John Murray, London.
27. DARWIN, C. (1877), "A biographical sketch of an infant," Mind, vol. 2, pp. 285-294.
28. DARWIN, C. (1883), The Origin of Species by Means of Natural Selection, or the preservation of favoured races in the struggle for life, 2 vols., 6th edn., John Murray, London.
29. DARWIN, F. (ed.), (1887), The Life and Letters of Charles Darwin, 3 vols., 2nd edn., John Murray, London.
30. DRUMMOND, H. (1894), The Ascent of Man, Hodder & Stoughton, London.
31. EUGENICS LABORATORY MEMOIRS (1907-1910), Nos. 1 - 15, University of London.
32. FISKE, J. (1884), Excursions of an Evolutionist, Houghton, Mifflin & Co., Boston.
33. GAITON, F. (1869), Hereditary Genius, MacMillan & Co., London.

34. GALTON, F. (1874), English Men of Science: Their Nature and Nurture, MacMillan & Co., London.
35. GALTON, F. (1880), "Statistics of mental imagery," Mind, vol. 5, pp. 301-318.
36. GALTON, F. (1883), Inquiries into Human Faculty and its Development, MacMillan & Co., London.
37. GALTON, F. (1889), Natural Inheritance, MacMillan & Co., London.
38. GALTON, F. (1892), Finger Prints, MacMillan & Co., London.
39. GALTON, F. (1897), "The average contribution of each several ancestor to the heritage of the offspring," Proc. Royal Soc., vol. 61, pp. 401-413.
40. GALTON, F. (1908), Memories of my Life, Methuen & Co., London.
41. GALTON, F. (1909), Essays in Eugenics, The Eugenics Education Soc., London.
42. GREEN, T. H. (1877-8), "Mr. Spencer and Mr. G. H. Lewes: their application of the doctrine of evolution to thought," Contemp. Rev., Vol. 31, pp. 25-53, 745-769; Vol. 32, pp. 751-772.
43. HARTLEY, D. (1748), Observations on Man, his Frame, his Duty, and his Expectations, reprinted 1834, Thomas Tegg & Son, London.
44. HOBHOUSE, L. T. (1906), Morals in Evolution: a study in comparative ethics, 2 vols., Chapman & Hall Ltd., London.
45. HOBHOUSE, L. T. (1926), Mind in Evolution, (1st edn. 1901), MacMillan & Co., London.
46. HUXLEY, T. H. (1864), Evidence as to Man's Place in Nature, Williams & Norgate, London.
47. KIDD, B. (1902), Social Evolution, 2nd edn., MacMillan & Co., London.
48. LANKESTER, E. R. (1900), "The significance of the increased size of the cerebrum in recent as compared with extinct mammals," Nature, vol. LXI, pp. 624-5.
49. LAWRENCE, W. (1816-1819), An Introduction to Comparative Anatomy and Physiology, with Lectures on Physiology, Zoology, and the Natural History of Man, J. Callow, London.
50. LEWES, G. H. (1858), "The spinal chord a sensational and volitional centre," Report Br. Asscn., pp. 135-8.

51. LEWES, G. H. (1859), The Physiology of Common Life, William Blackwood & Sons, Edinburgh.
52. LEWES, G. H. (1874-9), Problems of Life and Mind, 5 vols.:
 1st Series - The foundations of a creed
 2nd Series - The physical basis of mind
 3rd Series - The study of psychology
 Mind as a function of the organism
 The sphere of sense and the logic of feeling
 The sphere of intellect and the logic of signs
 Trubner & Co., London.
53. LUBBOCK, J. (1879), Scientific Lectures, MacMillan & Co., London.
54. LUBBOCK, J. (1882), Ants, Bees, and Wasps, Kegan Paul, Trench & Co., London.
55. LUBBOCK, J. (1912), The Origin of Civilisation and the Primitive Condition of Man, 7th edn., Longmans, Green & Co., London.
56. MAINE, H. S. (1883), Dissertations on Early Law and Custom, John Murray, London.
57. MALLOCK, W. H. (1898), Aristocracy and Evolution, Adam & Charles Black, London.
58. MARSHALL, H. R. (1896), "Consciousness and biological evolution," Mind, vol. 5, pp. 365-387, 523-538.
59. MAUDSLEY, H. (1873), Body and Mind, 2nd edn., MacMillan & Co., London.
60. MAUDSLEY, H. (1876), Responsibility in Mental Disease, 3rd edn., H. S. King & Co., London.
61. MAUDSLEY, H. (1876), The Physiology of Mind, MacMillan & Co., London.
62. MAUDSLEY, H. (1879), The Pathology of Mind, MacMillan & Co., London.
63. MAUDSLEY, H. (1886), Natural Causes and Supernatural Seemings, Kegan Paul, Trench & Co., London.
64. McDOUGALL, W. M. (1908), An Introduction to Social Psychology, reprint 1950, Methuen & Co., London.
65. McDOUGALL, W. M. (1911), Physiological Psychology 3rd edn., J. M. Dent & Sons, London.
66. McLENNAN, J. F. (1876), Studies in Ancient History, reprint 1886, MacMillan & Co., London.

67. MEDLICOTT, H. B. (1892), The Evolution of Mind in Man, Kegan Paul, Trench, Trubner & Co., London.
68. MERCIER, C. A. (1888), The Nervous System and the Mind, MacMillan & Co., London.
69. MERCIER, C. A. (1890), Sanity and Insanity, Walter Scott, London.
70. MERCIER, C. A. (1901), Psychology, Normal and Morbid, Swan Sonnenschein & Co., London.
71. MILL, James (1878), Analysis of the Phenomena of the Human Mind, 2 vols., ed. and notes by J. S. Mill; 2nd edn., Longmans, Green, Reader & Dyer, London.
72. MIVART, St. G. (1881), "Intellect and evolution," Br. Quart. Rev., vol. LXXIV, pp. 298-333.
73. MORELL, J. D. (1853), Elements of Psychology; Part 1 - Analysis of the Intellectual Powers, William Pickering, London.
74. MORELL, J. D. (1862), An Introduction to Mental Philosophy on the Inductive Method, Longman, Green, Longman & Roberts, London.
75. MORGAN, C. L. (1885), The Springs of Conduct: an essay in evolution, Kegan Paul, Trench & Co., London.
76. MORGAN, C. L. (1890-1), Animal Life and Intelligence, Edward Arnold, London.
77. MORGAN, C. L. (1896), Habit and Instinct, Edward Arnold, London.
78. MORGAN, C. L. (1900), Animal Behaviour, Edward Arnold, London.
79. MORGAN, C. L. (1906), An Introduction to Comparative Psychology, 2nd edn., Walter Scott Publishing Co., London.
80. MULIER, M. (1862), 3rd edn., Lectures on the Science of Language, Longman, Green, Longman & Roberts, London.
81. MURPHY, J. J. (1869), Habit and Intelligence in their connection with the laws of matter and force, 2 vols., MacMillan & Co., London.
82. MYERS, C. S. (1909), A Text-book of Experimental Psychology, E. Arnold, London.
83. MYERS, C. S. et al. (1910), "Instinct and intelligence," Symposium in Br. J. Psychol., vol. 3, pp. 209-270.
84. NOBLE, D. (1855), Elements of Psychological Medicine, 2nd edn., John Churchill, London.

85. OSBORN, H. F. (1894), From the Greeks to Darwin: an outline of the development of the evolution idea, MacMillan & Co., N.Y.
86. PEARSON, K. (1894-1901), "Mathematical contributions to the theory of evolution," Philos. Transacns., vol. 185, pp. 71-111; vol. 186, pp. 344-414; vol. 187A, pp. 253-318; vol. 191, pp. 229-311; vol. 197A, pp. 285-379.
87. PEARSON, K. (1897), The Chances of Death, and other Studies in Evolution, Edward Arnold, London.
88. PEARSON, K. (1900), The Grammar of Science, 2nd edn., Adam & Charles Black, London.
89. POULTON, E. B. (1896), Charles Darwin and the Theory of Natural Selection, Cassell & Co., London.
90. REID, G. A. (1896), The Present Evolution of Man, Chapman & Hall, London.
91. REID, T. (1843), Essays on the Active Powers of the Human Mind. an Inquiry into the Human Mind on the Principles of Common Sense, and an Essay on Quantity, ed. Wright, G. N., Thomas Tegg, London.
92. ROMANES, G. J. (1877), "Evolution of nerves and nervo-systems, " Nature, vol. 16, no. 406, pp. 289-292.
93. ROMANES, G. J. (1881), "Review of 'Conscious Matter; or, The Physical and the Psychical Universally in Causal Connection,' by Stewart Duncan," Nature, vol. 23, no. 598, pp.553-4.
94. ROMANES, G. J. (1882), Essays in Charles Darwin - Memorial Notices reprinted from 'Nature', MacMillan & Co., London.
95. ROMANES, G. J. (1882), Animal Intelligence, Kegan Paul, Trench & Co., London.
96. ROMANES, G. J. (1883), Mental Evolution in Animals, Kegan Paul, Trench & Co., London.
97. ROMANES, G. J. (1888), Mental Evolution in Man: origin of human faculty, Kegan Paul, Trench & Co., London.
98. ROMANES, G. J. (1893), An Examination of Weismannism, Longmans, Green & Co., London.
99. ROMANES, G. J. (1896), The Life and Letters of George John Romanes, written and ed. by his wife, Longmans, Green & Co., London.

100. ROMANES, G. J. (1897), Essays, Ed. Morgan, C. L., Longmans, Green & Co., London.
101. SEWARD, A. C. (ed.), (1909), Darwin and Modern Science, University Press, Cambridge.
102. SPENCER, H. (1855), The Principles of Psychology, Longman, Brown, Green & Longmans, London.
103. SPENCER, H. (1870-72), The Principles of Psychology, 2 vols., 2nd edn., Williams & Norgate, London.
104. SPENCER, H. (1876), The Principles of Sociology, 2 vols., Williams & Norgate, London.
105. SPENCER, H. (1881), "Professor Green's explanations," Contemp. Rev., vol. 39, pp. 305-311.
106. SPENCER, H. (1887), The Factors of Organic Evolution, Williams & Norgate, London.
107. SPENCER, H. (1888), Essays, Scientific, Political, and Speculative, 3 vols., Williams & Norgate, London.
108. SPENCER, H. (1904), An Autobiography, Williams & Norgate, London.
109. STEWART, D. (1818), Elements of the Philosophy of the Human Mind, 2 vols., 6th edn., T. Cordell & W. Davies, London.
110. STOUT, G. F. (1902), Analytic Psychology, 2 vols., 2nd edn., Swan Sonnenschein & Co., London.
111. STOUT, G. F. (1903), The Groundwork of Psychology, reprinted 1920, Univ. Tutorial Press, London.
112. STOUT, G. F. (1910), A Manual of Psychology, 2nd edn., W. B. Clive, London.
113. SULLY, J. (1874), Sensation and Intuition: studies in psychology and aesthetics, H. S. King & Co., London.
114. SULLY, J. (1892), The Human Mind, 2 vols., Longmans, Green & Co., London.
115. SULLY, J. (1897), Children's Ways, Longmans, Green & Co., London.
116. TYLER, J. M. (1896), The Whence and the Whither of Man, William Blackwood & Sons, Edinburgh.
117. TYLOR, E. B. (1878), Researches into the Early History of Mankind, 3rd edn., John Murray, London.

118. TYLOR, E. B. (1881), Anthropology, MacMillan & Co., London.
119. TYLOR, E. B. (1891), Primitive Culture - researches into the development of mythology, philosophy, religion, language, art and custom, 2 vols., 3rd edn., John Murray, London.
120. WALLACE, A. R. (1871), Contributions to the Theory of Natural Selection, MacMillan & Co., London.
121. WALLACE, A. R. (1889), Darwinism: an exposition of the theory of natural selection with some of its applications, MacMillan & Co., London.
122. WARD, J. (1886), "Psychology," in Encycl. Brit., 9th edn., vol. 20, pp. 37-85.
123. WARD, J. (1904), "On the definition of psychology," Br. J. Psychol., vol. 1, pp. 3-25.
124. WARNER, F. (1885), Physical Expression - its Modes and Principles, 2nd edn., Kegan Paul, London.

B. SECONDARY SOURCES

- I BORING, E. G. (1957), A History of Experimental Psychology, 2nd edn., Appleton-Century-Crofts, N.Y.
- II BURT, C. (1961), "Galton's contributions to psychology," Bull. Br. Psychol. Soc., no. 45, pp. 10-21.
- III DREVER, J. (1921), Instinct in Man, 2nd edn., University Press, Cambridge.
- IV ELLEGARD, A. (1958), Darwin and the General Reader: the reception of Darwin's theory of evolution in the British periodical press, 1859-1872, Gothenburg Studies in English, No. 8, Galtburg.
- V GLASS, B., TEMKIN, O., & STRAUS, W. L. Jr. (ed.), (1959), Forerunners of Darwin: 1745-1859, John Hopkins Press, Baltimore.
- VI HEARNshaw, L. S. (1962), "Sixty years of psychology," Bull. Br. Psychol. Soc., No. 46, pp. 2-10.
- VII HIMMELFARB, G. (1959), Darwin and the Darwinian Revolution, Chatto & Windus, London.
- VIII KANTOR, J. R. (1959), "Evolution and the science of psychology," Psychol. Record, vol. 9, pp. 131-142.

- IX MURPHY, G. (1949), Historical Introduction to Modern Psychology, 5th edn., Routledge & Kegan Paul Ltd., London.
- X PEARSON, K. (1914-1930), The Life, Letters and Labours of Francis Galton, 4 vols., University Press, Cambridge.
- XI RIBOT, T. (1889), English Psychology, Eng. Transln., Kegan Paul, Trench & Co., London.
- XII TAX, S. (ed.), (1960), Evolution after Darwin, 2 vols., University of Chicago Centennial, University of Chicago Press.
- XIII WALKER, H. M. (1929), Studies in the History of Statistical Method, Williams & Wilkins Co., Baltimore.
- XIV WARDEN, C. J. (1927), "The historical development of comparative psychology," Psychol. Rev., vol. 34, pp. 57-85, 135-168.

—oOo—

ABBREVIATIONS USED

- Br. J. Psychol. - British Journal of Psychology
- Br. Quart. Rev. - British Quarterly Review
- Bull. Br. Psychol. Soc. - Bulletin of the British Psychological Society
- Contemp. Rev. - Contemporary Review
- Encycl. Brit. - Encyclopaedia Britannica
- Philos. Transacns. - Philosophical Transactions of the Royal Society of London
- Proc. Royal Soc. - Journal and Proceedings of the Royal Society of London
- Psychol. Record - Psychological Record
- Psychol. Rev. - Psychological Review
- Report of Br. Assocn. - Report of the Annual Meeting of the British Association for the Advancement of Science

—oOo—