ASPECTS OF

TEMPERAMENT



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SOME OBJECTIVE ASPECTS

of TEMPERAMENT ---by J. S. A. Bois.

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Among the various constituents of personality, temperament is generally recognized as that something inborn and permanent which has always been linked with bodily characteristics.

The classical doctrine of four temperaments, left practically unchallenged until the beginning of this century, is now superseded by several new ones. Their theoretical basis differs, but they agree fairly well in considering temperament as a factor whose variations could be distributed on a continuum, ranging from an extreme type to the diametrically opposite. Jung's appellation of these types as introvert and extravert is the most widely used nowadays.

The means of diagnosing temperament now in use - psycho-physical methods and questionnaires - have some value, but none is so perfectly reliable as to rally the suffrages of all investigators. Graphology is proposed as an avenue of research in this field. The writer bases his proposition on the recent findings of experimental graphologists and on his own research work.

M. A.

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INTRODUCTION

The notion of temperament is one of the oldest in psychology. Every one who has to study human individuals, either as a physician, an educator, or a moralist, eventually classifies them according to certain typical traits. Some of these traits are acquired, others are innate.

Innate characteristics are of two kinds: some are common to all human beings and distinguish them from animals, some are special to a particular individual and distinguish him from his fellow-men. To group individuals according to their personal psycho-physical traits is to classify them according to their temperaments. The theoretical basis of such a classification may be anatomical, biochemical, physiological, or psychological; it does not matter much in these introductory remarks. We simply note here that practically all scientific observers, from Hippocrates and Aristotle to the psychologists of to-day, have agreed in putting under a limited number of headings, sometimes four, sometimes two, all personal traits which are taken as inborn. They have also agreed on the intimate relationship between bodily qualities and fundamental psychological make-up. Popular literature has echoed the scientific theories, and there is very little disagreement as to the general meaning of temperament.

In the present dissertation we shall,

a) review briefly the classical theory of temperaments and its various modifications;

b) set forth and criticize the modern approaches to a more scientific classification; c) propose an objective method for grouping individuals according to introversion and extraversion.

Chapter I

THE CLASSICAL DOCTRINE

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The classical doctrine of temperaments, which is still holding its own in everyday language, harks back to the assumptions of Hippocrates and his predecessors: Parmenides, Empedocles, Anaxagoras, Democritus, and Alcmeon of Crotona. As the parent doctrine, it contains the fundamental idea common to all subsequent theories, viz., individual psychological characteristics depend in some degree on a qualitative and quantitative mixture of physical elements.

Starting with the four elements of Empedocles: Earth, Fire, Water, and Air, and the four corresponding qualities: Cold, Hot, Moist, and Dry, Hippocrates arrived at four bodily humours which he describes as follows (30) :

> Blood, the combination of the Hot and the Moist; Pituita or Phlegm, the combination of the Cold and the Dry; Bile, the combination of the Hot and the Dry; Atrabile, the combination of the Cold and the Dry.

According to the predominance of one humour over the others, we have four different temperaments: the Sanguine, the Phlegmatic, the Bilious, and the Atrabilious (Melancholic).

The Father of Medicine was more immediately concerned with the relationship between temperament and health. Six centuries later, Galenus adopted the same classification, but he recognized explicitly the influence of temperamental dispositions upon the development of character. He wrote: " Those who think that the soul is not helped

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or hindered by the temperament of the body have nothing to say of the differences between children and can give no reason for the diversity of manner which makes some bold and others cowardly, or some intelligent and some stupid." (I). And elsewhere: " The good and the bad are such as they are because of the temperament of their body."(II) He also gives with much detail the variations in physical appearance which he believed to be determined by the mixture of humours.

That quartet of temperaments, inaugurated by Hippocrates and perfected by Galenus, held the stage in unperturbed security until the advent of modern physiology. But even then the same types remained practically unchanged in their fundamental characteristics; they merely donned a new garb in order to suit the fancy of new theorists. The classical doctrine could be summed up as follows:

1. It admits of four temperamental types;

2. It gives a description of their physical appearance;

3. It describes their psychological traits;

4. It seeks an explanation in the theory of humours. Of those four items, 1, 2, and 3 are left untouched; 4 is the only one to change. This statement is true, not only in the case of such avowed revivers of the traditional doctrine as Richerand and Stewart, but also in that of Haller, Kant, Wundt, and all the others quoted below.

(I) Ch. Darenberg. "Oeuvres traduites de Galenus", p. 91.(II) Ibidem, p. 84.

Richerand, in his "Elements of Physiology", published in 1812, gives us five types of temperaments, the four traditional ones and the nervous. But he notes that "the nervous is seldom natural or primitive, but commonly acquired and depending on a sedentary life or lack of activity." (13, 28). Such an acquired trait being not strictly temperamental, we may omit it and tabulate Richerand's description as follows:

Temperament.	Physical Characteristics.	Psychological Characteristics.			
1. Sanguine.	Healthy. Hair and complexion fair.	Easily affected, incons- tant, good memory, fond of pleasure and variety, marked by wit rather than genius.			
2. Bilious.	Skin d ark, hair bl ack.	Impetuous, violent pas- sions, undefatigable, ambitious.			
3. Melancholic.	Vital functions feeble, small muscles.	Suspicious, gloomy, dis- ordered imagination. capable of genius.			
4. Phlegmatic.	Pale, flabby, languid.	No concentration, bad memory, lazy. May be susceptible.			

In "Our Temperaments", published 80 years later by A. Stewart, the nervous is substituted in the place of the melancholic, and the phlegmatic is called lymphatic, but the same general outline remains. Temperament. Physical Psychological Characteristics. Characteristics.

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2.	Bilious.	Complexion and eyes dark, face square, build thickset.	Passionate, jealous, per- sistent, unscrupulous, well informed, prefers business pursuits.
3.	Nervous.	Complexion clear, eyes gray, face tapering, neck long, build slight.	Impulsive, excitable imag- inative, enduring in work, enjoys intellectual and muscular pursuits.
4.	Lymphatic.	Complexion pale, Eyes lustreless, build thickset.	Slow, heavy, not excitable, Persistent, not ardent, plodding, fond of physical comforts.

Haller (89,48), the founder of experimental physiology, saw no relationship between the quality of the blood and temperament, and he discarded the sanguine type altogether. However, his disciples included it in their revision of the master's "Elementa". For them as for Haller the different temperamental constitutions were due, not to the qualities of the humours, but to the relative strength and irritability of the solid parts of the body through which the blood flows. Hence the following classification:

1. Sanguine: slight irritability with moderate strength of tissues.

2. Choleric (bilious): irritability and strength of tissues.

3. Melancholic: irritability and weakness of tissues.

4. Phlegmatic: no irritability and weakness of tissues.

With Haller and his disciples the theory had shifted from the humours to the tissues. With Wrisberg, one of his most outstanding followers, it was transferred to the nervous system. People with a larger brain, with thicker and firmer nerves and with high sensitivity were called sanguine or choleric; those with a smaller brain, very fine nerves and duller sensitivity were melancholic or phlegmatic.

Kant (30, 696) considers temperaments as both physiological

facts and psychological tendencies. But he is more interested in psychological phenomena than in the humoral or neurological explanation. By combining feeling and action with tension and relaxation of vital energy, he arrives at the following formulation of the Galenian quartet:

> Sanguine: feeling and tension. Choleric: action and tension. Melancholic: feeling and relaxation. Phlegmatic: action and relaxation.

As one would expect, Wundt (89, 68) bases his theory on the analysis of the type of reaction elicited by the different individuals. Their reaction is either quick or slow, strong or weak. Hence the following distribution:

> Sanguine: quick and weak. Choleric: quick and strong. Melancholic: slow and strong. Phlegmatic: slow and weak.

We could quote a great number of other variants in the theory attached to the traditional fourfold division of temperaments, such as Hellwig's, Uerbart's, Kreibig's, Ribéry's, Elsenhaus', and Carus'. But there is no truly experimental work to support them. M. F. Baxter (6), doing some research in the laboratory of the University of Michigan, in 1923, is the only one who put the theory to an experimental test.

Her purpose was to subject to trial Wundt's theory of the quick-weak, quick-strong, slow-strong, slow-weak temperaments. But she attempted to cover other theories at the same time, namely Bahnsen's "receptivity and spontaneity", Ribéry's "strong and quick

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motor and sensory reactions", Hellwig's "reception and reaction", and she ended by giving a definition of strength which makes of her fundamental hypothesis an entirely new one. The speed index was the time required to perform a given task. Strength was, to use her own terms (6, 60), "that element in efficiency when the speed or rate factor in a performance is disregarded; i.e. quality or excellence".

She made use of three sets of measures, a) a series of 10 strength and 14 speed tests such as tapping, simple or association reaction time, maze tracing, cancellation, voluntary reading time, pressure in writing, etc., b) pulse rate as a speed score and systolic blood pressure as a strength score, c) personal questionnaires to be answered by the subject himself, by a near relative, and by three acquaintances. Forty-four subjects were studied.

The physical measurements (pulse rate and blood pressure) gave practically no evidence of types and did not in general appear to be consistent with the results on the tests.

The scores of the tests and questionnaires, as regards both speed and strength, gave a negligible degree of correlation. Even in extreme cases, which had been expected to provide type standards, the twp sets of scores were in complete disagreement as often as in agreement.

It is to be regretted that, instead of adopting a definition of rate and strength already given by one of the authors she mentions, Baxter coined one of his own which is even less in line with the traditional doctrine. Before being given an experimental testing, a hypothesis should evince a certain degree of probability. One wonders what physiological data could give Baxter the faintest hope that her

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"strength-excellence" factor would correlate with systolic blood pressure.

In the questionnaires new factors are introduced, such as activity (6 questions), steadiness (7 questions), cheerfulness (7 questions), ease of emotions (7 questions), intensity of emotions (4 questions). Against such a motley background speed was delineated with 14 traits and strength with 29. How could they be expected to come out in bold relief, I am at a lost to know. But no elaborate statistical treatment of data gathered in such random fashion could bring order out of the primitive theoretical chaos.

In conclusion we may say that Baxter's experiment did neither confirm nor disprove the traditional four-fold classification of temperaments.

Should that doctrine, "which has haunted the house of psychology for twenty-five centuries" (Allport), be cast aside as mere rubbish? Or does it contain some elements of truth?

One is loath to believe that so many philosophers and psychologists have erred completely on that subject. Even if the study of temperaments was for them, as Roback puts it (89, 66), " a lounging place in which to seek diversion after a strenuous search of truth in more businesslike premises", we may safely assume that, while enjoying relaxation, their intellect was not entirely devoid of the qualities displayed in more serious tasks. Their observations are concurring in a striking degree, and they must have some objective foundation. One hundred and fifty years ago, Wrisberg suggested to make the fourfold division a double category, viz., sanguine-choleric and melancholic-phlegmatic. This simple change would indeed cause the

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time-honoured doctrine to evolve into the modern bi-modal division of temperaments. And under the multitudinous theories we all agree in seeing the same broad outline of objective reality. Chapter II

WILL-TEMPERAMENT TESTS

In the determination of the psychical foundations of personality, some authors insist on what they call "the dynamic factor".

Ach (13, 87) considers temperament as an expression of individual differences in feeling and willing capacity, and in the general strength of persistence of determining tendencies. In his experiments the determining tendencies were constituted by the particular instructions given by the experimenter. From these to really inborn determining tendencies the distance is so great that the experimental evidence brought to bear in favor of his theory may be considered as hardly conclusive.

Meumann (89, 81) defines temperaments as affective forms of action which depend on the cooperation of innate affective and volitional dispositions. By combining the fundamental qualities of the feelings, namely their pleasantness and unpleasantness, with their ease or difficulty of excitability, with their intensity and persistence, with their activity and passivity, he arrives at twelve temperaments. Not content with that, he adds another important consideration, viz., the mode of expression of the feelings. His theoretical discussion is most elaborate, but experimental evidence is lacking in its support.

June Downey (27) starts her investigation from the fact that in everyday life we judge character by action. For ten years she experimented on muscle-reading and found out that the subjects used as "guides" by the reader could be classified in two groups: the suggestible and impulsive whose unconscious movements were exaggerated and easily detected, and the critical and self-controlled whose movements were limited in extension and hardly perceptible.

In order to have a permanent record of explosiveness and motorinhibition, she devised a series of tests in which the subjects are required to write under definite directions. Four tests are described as speed tests and are labeled: Speed of Movement, Freedom from Load, Flexibility, Speed of Decision; four are tests of aggressiveness: Motor Impulsion, Reaction to contradiction, Resistance, Finality of Judgment; four are tests of carefulness and persistence: Motor Inhibition, Interest in Detail, Coordination of Impulses, Volitional Perseveration. The results are presented in the form of a psychogram called a "will-profile". By will, explains Dr. Downey (27, 60), "no mysterious power is to be understood; it refers merely to the dynamic pattern of the individual." In the profile the pivotal traits are Motor Impulsion and Motor Inhibition.

Downey was interested in studying the interrelation of traits in an individual rather than in comparing the scores of different subjects. As a consequence her tests have a very limited value as an index of personality or as a means of rating an individual on a continuous temperamental scale.

By having judges identify will-profiles, she brought a certain amount of evidence to show that the tests measure what they are intended to measure, but certain traits being inversely correlated, the profiles cannot be taken as manifestations of a single temperamental factor analogous to Spearman's general intelligence factor "g" or anything of the kind. Therefore the author's contention that temperament as revealed by her tests is an innate relatively permanent disposition is defeated by her own findings. The W.-T. tests do not reveal one

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permanent homogeneous factor, but several personality traits, many of which are still to be proven innate.

The very name of will-temperament is misleading. In her own definition Downey notes that "will" was prefixed to "temperament" in order to make it plain that among the non-intellectual character traits she was measuring, not the emotional, but the dynamic. To quote her verbatim; "The will-temperament determines the form assumed by character", it "determines the use that will be made of general intelligence". (27, 60).

Such ambiguous definitions make it very difficult to validate the tests by the method of estimates. Even after a careful study of the definitions of the various traits given by the author herself, one is in doubt as to their exact delimitation. In order to build up a criterion for purposes of correlation between the W.-T. scores and teachers' estimates, Ruch and Del Manzo (93, 73) grouped the subjects according to the strength or weakness of their will-power as understood by the man in the street. Such a rapprochement is at least arbitrary, and the statistical treatment of the results throws very little light on the problem.

N. C. Meier (69, 387) and M. J. Herkovits (44, 76) realize also that the definitions of the traits given by Dr. Downey are difficult to grasp. Both find a very low correlation coefficient (Meier: 0.118, Herkovits: 0.13) between the test scores and the estimates made by persons well acquainted with the subjects tested. Herkovits (44, 80) adds that "there is no pronounced homogeneity in any one set of traits, the correlation in the first four varying from -0.05 to 0.18, in the second four from 0.10 to 0.35, in the third from -0.14 to 0.29.

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In his first study of the W.-T. tests, Oates (75, 5) goes on to criticize the objectivity of the scoring of the following traits: Flexibility, Motor Impulsion, Reaction to Contradiction and Co-ordination of Impulses. He tabulates the inter-correlation between the traits having the highest average correlation with the other 11 traits (i.e. Freedom from Load, Speed of Decision, Speed of Movement and Co-ordination of Impulses), as well as between those having the lowest average correlation (i.e. Motor Inhibition and Volitional Perseveration). He infers from these data that there appears a fairly wide group factor operating in those qualities (75, 27). That factor he assumes to be something in the nature of psycho-neural plasticity. He recalls the fact that in the early days of intelligence testing the intercorrelations were low, and he expresses the hope that the Downey test may be gradually refined and may eventually play a prominent part in the investigation of human personality.

In a later study (76, 118), he examines more fully the nature of the temperament qualities functioning in the W.-T. test. Fifty subjects were studied. They were given the Downey test and a battery of 10 Intelligence tests. The marks obtained by them in two School Terminal Examinations provided data for the measurement of their scholastic achievement. Oates' investigation was carried on by the method of factor analysis. His conclusions are as follows:

1. There is a general temperamental or emotional factor entering in the Downey tests which is closely related to general emotionality and may be provisionally identified with it.

2. There is little if any direct relationship between temperament as measured by these tests and general intelligence.

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3. Examinations and intelligence correlate on account of a general intellectual factor which may be identified with Spearman's "g".

4. Examinations and temperament correlate on account of a general temperamental or emotional factor. This accounts for the failure of some boys of high intelligence to do well in school examinations.

5. There are apparently two group factors operating in the qualities involved in the tests. One is most apparent in the results of tests 2, 4, 11, 10, and 1; it manifests itself in the speed and ease with which temperamental or emotional energy is allowed to express itself. It would be due to the predominance of "sthenic" or aggressive instincts. The second factor would represent different aspects of a process of inhibition which hinders nervous energy from expressing itself immediately in motor action.

We thus reach the conception of two temperamental sub-types, the aggressive and the inhibited, which are the Sosias of Jung's extravert and introvert, of Binet's objective and subjective, and of countless others which we shall study in the following chapters.

We must pause here and pay special attention to the strange fate of the W.-T. tests in the course of their relatively short existence. In 1923, the author of the test states (27, 60) that her purpose is to measure "innate dynamic tendencies" at the exclusion of the emotional traits. In 1929, D. W. Oates, who gave the most constructive criticism of the tests and seems to have derived from their results the most suggestive significance, asserts that "the general factor" brought to light by the Downey tests "is some wider

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temperamental factor which has close affinity to general emotionality".

Is this flat contradiction? Apparently, yes. Really, no. After all, the wording of theories has a very secondary importance. Until a scientific law is well established, we may each of us give a different name to the same objective reality which each one of us approaches from a different direction. "Psycho-neural plasticity", "general emotionality", "inmate dynamic pattern" are such names. They cover an aspect of personality which is not purely intellectual and which seems to be bi-modal. For the time being any further precision would go beyond the limits set by experimental findings. The old term temperament is undoubtedly neither worse nor better, but it serves the purpose just as well.

Chapter III

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THE FIRST PERSONAL INVENTORY

As early as in 1905, G. Heymans (89, 242; 30, 696; 45, 429) attempted to classify temperaments on a strictly experimental basis. He drew up a list of 90 psychological traits, sent it to the 3000 physicians then practising in Holland, and requested the doctors to base on that list a psychological description of as many of their patients as they could. 400 practitioners answered, giving data on 2513 individuals whom they claimed they knew very well.

Heymans studied also the biographies of 110 historical or notorious personages: poets, philosophers, scientists, statesmen, criminals, and he noted down which of the 90 chosen traits were present or absent in their psychological make-up.

In his selection of characteristic traits, Heymans had guided himself by a theory which apparently received some confirmation in the statistical study of the data accumulated. His theory ran as follows: There are three fundamental criteria for the rating of character: emotivity, activity, "primary" or "secondary" function. Emotivity and activity need no explanation. In the questionnaire there was one direct question concerning emotivity: "Is the subject emotional or not?" For activity the questions were numerous and covered many aspects of the trait, v.g., "Is the subject diligent at his work? Does he set down to work quickly? Does he continue without unnecessary interruptions?" The somewhat strange designation of primary or secondary function was borrowed from Otto Graus, who had

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introduced it in 1902, in a book on physiology, "Die cerebrale Secundärfunktion". In Heymans' own words (89, 245 note), "the primary function of ideas or other mental contents signifies nothing else but their mental efficiency as long as they are conscious; and their secondary function, nothing else but their efficiency when they have sunk below the threshold of consciousness."

According to the questionnaire, a subject is of a "primary function" when he is easily comforted, easily reconciled, changeable in his sympathies, easy to speak to, more interested in new impressions and pleasures, looking for immediate results, sometimes acting in contradiction with his fundamental ideas, etc. Diametrically opposite tendencies would put him in the secondary function group. In other words, the former type is characterised by change, lightness, lack of endurance and ready susceptibility to objective stimulation, while the latter shows seriousness, solidity, endurance, and great susceptibility to ideational stimulation. When exaggerated, the secondary function leads to poor adaptibility, lack of presence of mind, a reduced sense of reality, sterile brooding, melancholia, paranoia. If carried to an excessive degree, primary function will exhibit an inferiority due to shallow consciousness, superficiality, incoherence, mania.

On the basis of the three fundamental criteria, Heymans and his collaborator, E. Wiersma, set up eight types of characters after this fashion:

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Emotive-non active: a) of primary function: nervous;

	Ъ)	of	secondary	11	:	sentimental;
Non emotive-active:	a)	Ħ	primary	Ħ	:	sanguine;
	b)	Ħ	secondary	¥	:	phlegmatic;
Emotive-active:	a)	Ħ	primary	11	:	choleric;
	Ъ)	Ħ	secondary	Ħ	t	impassioned;
Non emotive-non act:	ive: a)	11 11	primary fund	:tion	:	amorphous;

b) "secondary "

The two last types, the amorphous and the apathetic, are entirely missing in the biographical sketches collected by Heymans. It seems that such characters have too few positive qualities to rise to any prominence.

: apathetic.

Among instances of the first types, we may mention Byron and Fritz Reuter classified as nervous, Robespierre and Rousseau as sentimental, Frs. Bacon and Lessing as sanguine, Franklin, Hume, Kant, Locke, Mill, Taine as phlegmatic, Danton, Dickens, Mirabeau, Scott as choleric, Michel-Angelo, Pascal, Pasteur and Nietzche as impassioned.

The designation of primary and secondary function invites us to group these six types in two triads, viz., the nervous, the sanguine and the choleric on the one side, the sentimental, the phlegmatic and the impassioned on the other. A composite psychogram made of the several traits ascribed to the three temperaments of either group would give us two profiles resembling the types well known in the psychological literature of recent years, the extravert and the introvert, the cycloid and the schizoid, the aggressive and the inhibited.

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Heymans' work was the first in which questionnaires and statistical methods were used. E. Elaparède hailed it as "the first experimental and exact contribution to the psychology of temperaments". (I) The investigators who followed in Heymans' wake have neither discussed nor increased his biographical material; but they have reviewed the questionnaires and given their answers a more thorough statistical treatment. However, their main conclusions are substantially in agreement with his. From the very beginning of experimentation on temperaments to the present day one general truth seems to come out in ever higher relief from the mass of observational data; temperament is a bi-modal, innate, and non-intellectual component of character.

(I) Archives de psychologie, 8, 208.

Chapter IV

INTROVERSION - EXTRAVERSION

Of all recent attempts to classify temperaments in two contrasting groups, the most successful hitherto is Dr. Jung's characterization of introverts and extraverts. In 1913, at the Psychoanalytic Congress held at Munich, he pointed out to the striking contrast existing between the general physiognomy of dementia praecox and that of hysteria, particularly in the attitude of the sufferers towards the external world. The praecox is characterized by extreme apathy, the hysteric by extreme emotivity. In the former the fundamental striving of the individual (the "libido") has a centripetal tendency; in the latter, its direction is centrifugal. Jung kept the Freudian appellation "libido", but he gave it a much wider meaning than Freud did. The founder of Analytic Psychology makes his a remark of M. Moltzer (55, 288 note): "The concept of energy is that which comes nearest to the concept of 'libido'. Libido can perhaps be described as 'effect' or 'capacity for effect' ". Elsewhere he is quoted as saying (67, 27): "This energy may also be designated as 'hormé'. Hormé is a Greek word - force, attack, press, inpetuosity, violence, urgence, seal. It is related to Bergson's !élan vital'." With most psychiatrists, Jung considers the neurotic as a normal individual gone wrong, i.e., whose temperamental enrgies have broken loose for some reason or other. As a consequence he accepts the same fundamental centripetal and centrifugal direction of the "libido" in normal people as in the psychotic. When the energy is turned inwards. one is an introvert; when it is turned outwards, an extravert.

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Various portraits have been drawn of these two types. They resemble in a striking manner James' "tender-minded" and "tough-minded", Binet's "subjective" and "objective", Nietzche's "Apollonian" and "Dyonisian", Heymans' "secondary" and "primary" functions.

No one claims that human beings can be classed in two sharply differentiated groups. They should rather be placed in a continuously graded series, ranging from extreme introversion to extreme extaversion, the majority falling in the middle of the distribution, as in a normal frequency curve.

Jung writes (56, 99): "Introversion or extraversion, as a typical attitude, means an essential bias which conditions the whole psychic process, establishes the actual reactions, and thus determines not only the style of behaviour, but also the nature of subjective experience".

Beatrice M. Hinkle (46, 142) describes the two Jungian types in the following terms:

"One type of individual (the extravert) looks eagerly and hopefully out upon life and its possibilities, goes forth with confidence to meet it, feels 'what others do, I can do also', has a friendly attitude and sense of belonging and being at home in the world, and is usually quite unconscious of himself or of any deep philosophical problem within life, unless something happens to throw him back upon himself and make him aware. His general attitude is positive and affirmative, and, on the whole, uncritical. He is what Nietzche calls the 'Yea Sayer', and is easily occupied and identified with many objects outside of himself. His natural inclination is to scatter and spread out over the surface of life instead of concentrating and penetrating deeply."

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"The other group looks upon the world rather thoughtfully and soberly. The individual regards it somewhat with distrust; it is an unknown place, full of disturbing elements, which are alien to him. He is separate and distinct from it and feels it is more inimical than friendly, and, therefore, bears careful watching to see that it does not overwhelm or harm him. There is an element of suspicion always present even though he may not realize this, and he feels he must move cautiously in order to gain his own aims, otherwise he will surely be denied. The situation itself, or the object and its claims, gains little positive and independent consideration, for his consciousness is primarily focussed upon his ego and its safe-guarding. He is generally very self-conscious and never, except in moments of exaltation or intense excitement, does he lose his awareness of self. This produces a definite effect upon his attitude to the world and towards the object which is viewed entirely according to a subjective valuation."

Jung's distinction of temperaments came out of his clinical experience. Many psychiatrists maintain that the long, careful and patient observation of mental cases is the only safe road to a real knowledge of the deep-lying sources of human activity. The stream of normal psychic life is too complex to be analysed by mere introspection or passing observation; situations created in the psychological laboratory are too artificial to give a lifelike picture of the subject's ordinary reactivity; but in the broken and disintegrated life of the neurotic we see Nature itself conducting an experiment in life's own laboratory. There the psychic center of activity of the subject shifts from the cortical to the subcortical level, laying bare, as it were, the elementary tendencies of the individual, his undisguised,

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uneducated, and uncontrolled bedrock ego.

Once elimination has been made of the disorders directly attributable to accidental and physical causes, such as toxeamia and exhaustion - where the prominent clinical features are delirium and stupor and epilepsy and general paralysis, we have left the important class known as bio-genetic psychoses. These can be divided into two main groups, a) the schizophrenic, including the dementia praecox, the paraphrenias, and the paranoias, b) the cyclothymic including all varieties of manic-depressive cases. Assuming that a congenital disposition is at the bottom of such troubles, we may go back into the anamnesis of the schizophrenic, and we shall find there traits easily recognizable, perhaps in lesser number and degree, in the behaviour of normal people. Such people are called schizoid by Kretschmer, and they a very reminiscent of Jung's introverts. A similar investigation in the history of the manic-depressive patients will give us a picture which has a great many features in common with the extravort.

Kretschmer finds a correlation between his two mental types and certain physical peculiarities. Thus the cycloid would be more likely to have a round, compact and full physique (the pyknic type), and the schizoid would be most often lean, long and flat-chested (the asthenic type). This correlation bears out the view that these mental types are in a large measure determined by the innate constitution. But Kretschmer's conclusions are merely tentative. He studied a very limited group, the Schwabian population. A similar study should be done of a racially more varied population before the cycloid-pyknic and the schizoid-asthenic correlations be used for diagnostic purposes.

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Many other temperamental types which have been independently launched are nevertheless extremely similar. And it is easy to see that those already studied in the present dissertation, the primary and secondary function of Heymans, the aggressivity and inhibition factors derived by Oates from the results of the Downey tests, the extraversion and introversion of Jung, and the cycloid and schizoid dispositions outlined by Kretschmer, all these and a host of shorter-lived conceptions are barely distinguishable for the casual observer. A more critical investigator may see their partial divergences, but, if he is careful not to insist exclusively on these, he will easily form with the various descriptions a composite picture which certainly has an objective value. Both observation and experimentation bring the students of human personality to a bi-modal distribution of temperaments; and hitherto no experimental proof has been brought against such a distribution.

Jung's classification is undoubtedly the most widely known. It is in the light of his theory that most experimental work is being done. The extreme introvert and the extreme extravert are at each end of a scale which could be represented by a straight line. Hence the facility of quantitative distinction between the various degrees of the temperamental factor. Jung contented himself with the clinical observation of thousands of patients. The task of the psychologist is to reduce to so many well-defined traits the clinical picture of the two contrasting types, and to devise tests which will make it possible to recognize and measure such traits in persons of various ages and mental levels. These tests should be, as much as possible, devoid of artificiality, easily ratable, and so objective as not to be easily distorted by the emotional make-up of the subject or by the intellectual bias of the experimenter.

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Chapter V

PSYCHO-PHYSICAL METHODS OF DIAGNOSIS

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"We may assume that the position of any subject in this scale (introversion-extroversion) is a function of some quite general property of his nervous system; and we may assume with considerable probability that this property again is a function of some chemical product or products of metabolism; that, in short, each subject's position in the introvert-extrovert scale is mainly determined by some chemical influence of the nature of a hormone or endocrine secretion, or some complex resultant of the general metabolism." (67, 442).

Thus writes McDougall, one of the outstanding adherents to Jung's theory of temperaments. His statement opens before the research worker an immense field of experimentation.

McDougall himself had noted that closed-in personalities are easily made to expand under the action of certain drugs, notably alcohol. On the other hand, drugs of the antagonistic class, morphine for instance, will bring the extrovert from a state of hyperactivity to one of day-dreaming. In order to measure in some degree the action of these and allied drugs, Dr. McDougall resorted to the following experimental procedure. (67,444). The subjects were presented some well-known ambiguous figure, v. g., Shröder's staircase, Necker's cube, and the rate of fluctuations per minute was recorded. McDougall found that the best object for the experiment was a small model of a windmill. If the arms be w^atched from little distance and in a position where the line of vision is at an

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angle of some 20 or 30 degrees from the plane of rotation, the arms will appear to reverse their motion at short intervals.

The introvert subjects experienced rapid alternation, while the extraverts displayed a slow rate of change. Alcohol, chloroform, and ether produced a marked slowing of the rate, whereas morphine, strychnine, tea, and coffee produced more frequent alternations. For instance, the windmill alternations, which were 10 to 12 per minute for a subject in the normal state, were reduced to 1 per minute by alcohol, to 2 by chloroform, and increased to 30 and 22 p. m. by strychnine and tincture of opium.

The same experiment was repeated by John H. Ewen in 1930 (32). Ten typical cases of schizophrenia and ten of manic-depressive psychosis were given the following tests: Schröder's staircase, Scripture's blocks, Necker's cubes, and McDougall's windmill. All the subjects were women. As a control group, ten normal women of about the same age were given the same tests.

The average of alternations per minute was 27.5 for the schisophrenic, 2.75 for the cyclothymic, 16.3 for five of the control group, and 8.4 for the remaining five of the same group. The report does not mention whether these normal subjects were otherwise studied as regards introversion-extraversion. It does not tell either if any attempt was made to measure the variation of their fluctuations of attention under the influence of drugs.

In the case of the insane subjects, the results may be tabulated as follows:

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Schizophrenic.

Drug given.	Quantity.	Time of	retest.	Consequent rate of alternation.			
Alcohol.	15 cc. in 45 cc. of water.	30 min.	later.	18.15	per	minute.	
Ether.	5 inhalations	.Immedia	tely.	19.7	Ħ	ŧŧ	
Adrenaline hydrochloride.	3mof a 1/1000 solu- tion hypoder- mically.	30 min.	later.	20.4	Ħ	Ħ	
Ephedrine hydrochloride.	l gr. hypo- dermically.	30 min.	later.	20.7	Ħ	Ħ	

Manic-depressive.

Tincture of opium.	40m by mouth.	90 min. later.	7.67	Ħ	Ħ
Caffeine citrate.	3 gr. in a little milk.	30 min. later.	7.45	Ħ	Ħ
Strychnine nitrate.	1/15 gr. by mouth.	2 hrs. later.	6.9	Ħ	W
Atropine sulfate.	l/100 gr. hypoder- mically.	50 min. later.	3.92	Ħ	Ħ

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These results are worthy of attention. Because of the limited number of subjects they are not entirely conclusive, even for schisophrenia and manic-depressive insanity, but they point in a very definite direction, and they must be taken in account. As regards normal introverts and extraverts, we shall presently see that the case is not so clear.

The writer knows of another extremely interesting instance of the action of drugs in certain cases of cyclic psychoses. In a paper yet unpublished, Dr. E. C. Menzies (71) gives the outline of a successful treatment of carefully chosen cases of acute mania by the induction of a prolonged twilight condition. It seems that narcotics used for a sufficiently long time and in massive doses, (great care being taken of the general condition of the patient), will bring within the limits of normalcy a cyclothymic whom a disturbance of metabolism was going to throw off control.

Guilford and Braly (38) used the Necker-Wheatstone cube and experimented on 20 subjects. Their procedure was different from McDougall's in this respect: they directed their reagents to remain in a passive attitude, i. e. not to make any effort to foster or to retard the alternations, whereas McDougall had directed his to prevent them as best they could. They found that the rate of fluctuation is a highly reliable measure of some psychological function, but that it differs from day to day for the same individual. Yet, the measurable quantity of the function is sufficiently constant to be characteristic of an individual. That function, as measured by the fluctuations of the Necker cube, and introversion-extroversion, as measured by the Neymann-Kolstedt test, have a correlation coefficient of -.139, with a P. E. of .148. Alcohol has no constant influence on that function.

Guilford and Hunt (40) also found that the rate of fluctuation of the Necker cube is a constant attribute of personality, and that it always correlate negatively with the extent of the knee jerk. But it does not correlate significantly with any of the following temperament tests: Marston's, Laird's or Neymann-Kolstedt's.

E. C. Webster (112) found a very low negative correlation (-.139) between the rate of fluctuations of the ambiguous cube and the scoring on Bernreuter's introversion-extroversion inventory.

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Do the above results impeach the value of Ewen's findings? No. The personality inventories and temperament questionnaires now in vogue will be discussed in another chapter of this dissertation. We shall see that, because of their lack of differentiation between introversion and neurotic tendency, they are not altogether reliable as a means of diagnosing temperament. Therefore their low correlation with the psychological function revealed in the tests of fluctuation of attention does not annul the relationship which Ewen found between the latter and the two contrasting psychoses, schizophrenia and manicdepressive insanity.

In their search for a simple and easily ratable test of introversion-extraversion, Roberts and Fisher (90) resorted to a variety of the classical mirror-tracing experiment. They assumed that the degree of extraversion in a subject should show itself in his adaptation to an unlearned objective situation on the sensori-motor level.

They made use of a six-pointed star, 48" in perimeter, cut in a sheet of brass and mounted on glass. It had to be minorror-traced with a metallic pencil mounted in a circuit. At each contact with the sides of the slit the pencil would cause a sounder to work, but the experimenters did not take these errors into account. They only recorded the time taken to trace the star. The subjects, 35 in all, were first interviewed for from 30 to 60 minutes, which interview was the basis of the experimenters' judgment as to the subjects' introversion; then they were given the Bernreuter inventory; and finally they did the mirror-tracing. The experimenters' personal judgment was rated on a scale ranging from 0 to 10, 0 being extreme extraversion and 10 extreme introversion. The correlation coefficients

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(Pearson) between the three sets of scores are as follows: Experimenters' rating and Time of tracing...... 0.915 P.E. .018 Experimenters' rating and Bernreuter's B3-I..... 0.317 P.E. .101 Time of tracing and Bernreuter's B3-I.....-0.248 P.E. .106

For one who has already done some research along those very lines, these results are simply amazing. It seems too good to be true ! The mirror-tracing experiment, with a slightly different apparatus, has now been used for a few months by E. C. Webster and the writer, in the McGill Psychological Laboratory, as a tentative means of rating the degree of introversion. We have not yet arrived at a final conclusion, but the results obtained so far are not such as to indicate so high a correlation.

Roberts and Fisher's experiment is open to a few criticisms: 1. An interview of from 30 to 60 minutes is not sufficient to rate a subject on an intreversion-extraversion scale of such a wide range. 2. The experimenters do not give us the criteria they followed in rating the subjects.

3. The very high correlation coefficient leads one to believe that, since the experimenters were themselves the interviewers, they may have quite unconsciously tried to guess during the interview, by observation and questioning, the probable speed of the subjects at mirror-tracing.

4. The number of subjects is too limited to warrant any but a tentative conclusion.

But it is certainly worth while to keep on that line of approach, with, however, these few improvements in the procedure:

1. The test should be given to as many patients as possible

who are definitely classed as typical schizophrenic or manic-depressive.

2. It should be administered to at least 100 normal subjects who, after a thorough psychological inventory and months of close observation, would be classed on an introversion-extraversion scale. This rating should be done by competent psychologists who have not the mirror-tracing experiment in view.

Chapter VI

MODERN SCIENTIFIC APPROACHES

As early as 1882, Bouchard (1) spoke of a relationship between temperament and general metabolism. A few years later Alfred Fouilléé (33) grouped temperaments under two headings: "tempéraments d'épargne" (anabolic) and "tempéraments de dépense" (catabolic). In 1931, Allendy (1) insisted upon the fact that the child, in whom anabolism prevails, does not react to illness as the old man does. He allies catabolism with old age. In the adult he observes both anabolism, which corresponds to plasticity, and catabolism, which varies with tonicity. Hence his four-fold classification of temperaments: atoni-plastic, toni-plastic, toni-aplastic, atoni-aplastic.

Some investigators did not content themselves with such mere generalizations, but they endeavoured to establish a relation between the endocrine glands, the generally recognized regulators of metabolism, and temperamental traits.

Curt P. Richter (87) attempted to measure the spontaneous activity of white rats as modified by the removal of certain glands.

The rats were put in cages where they had free access to a revolving drum on which a cyclometer was adopted. On the first days the rats were sluggish. Their activity increased gradually until it reached a fairly constant plateau. This took from three to four weeks. The females showed a peculiarity: instead of remaining level, their activity varied according to a definite 4 or 5 day cycle, each peak (lo miles a day) corresponding to ovulation. In the intervening days

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they would not run so much as a mile in 24 hours.

Certain glands could be removed without affecting in any way the activity of the rats. These were the pineal gland, the thymus, the spleen, the posterior lobe of the pituitary, the seminal vesicles, and the uterus and cervix. The glands whose removal decreased spontaneous activity were (in order of decreasing influence): the hypophysis, the adrenals, the gonads, and the thyroid.

The decrease of activity was not the only phenomenon observed. Long regular cycles of activity, similar to the shorter ones already observed in the females, made their apparition after the total or partial removal of the pituitary, the thyroid, or the ovaries. Injury to the pituitary and section of the stalk gave a 14-day cycle. Removal of the thyroid produced general instability and a 25- to 35day cycle of activity. In the case of the partial removal of the ovaries (an entire one and part of the other), the cycle extended to from 90 to 120 days.

Cycles in food and water intake were also observed when the thyroid was taken away, or when the pituitary stalk was cut.

In the inactive thyroidectomized animal a feeding of desirecated thyroid restores activity and does away with the cyclical changes.

The inactive gonadectomized animal may be made active again by implantation of testes or ovaries, or by an injection of follicular fluid.

Feeding of the pituitary, desideated or fresh, brought about no change in hypophysectomized subjects. And no attempt was made in adrenal replacement therapy.

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Hyperactivity could not be produced experimentally in intact animals, although Richter reports that Hoskins had, in a similar experiment, an animal which ran itself to death after many testicular injections.

Even if one feels that a cautious conservatism should be the safest course in drawing conclusion from that experiment, one cannot help but admit that a most promising field of research has been opened. Every one who has any experience with the cyclical changes observable in mental patients, with periodic drinking, truancy, and stealing of social misfits, in fact, every observer of human nature who notices in himself and in others changes for which neither environment nor education can account, is strongly induced to think that at the bottom of such mysterious phenomena lies hidden some glandular disturbance.

With respect to the action of the development of the gonads, Edwards (29) remarks that in childhood there is little difference between boys and girls; at puberty the gap widens; after marriage, striking constitutional alterations will often accompany a change of outlook. "The unlightened single woman is surprised when her slimlybuilt friend develops into a fat comfortable wife. The girl who was nervous, hyper-sensitive, impatient and full of dynamic drive, becomes settled, complacent and lethargic." (29, 288). Menopause allows masculine elements to come to fuller expression.

On the other hand, the same writer and many others, Pascal for instance (78, 1514), remind us of the fact that the malfunctioning of the endocrines may also have a purely psychological origin: a strong emotion, a sudden bereavement, a deception in love, etc.

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Berman (9, 338) reports a curious experiment made by Hammett which illustrates how emotional reactions have an influence upon glandular activity. Hammett took two groups of albino rats of the same ancestry and brought them up under exactly similar conditions, with this only exception that one group were systematically petted and gentled, while the others were always handled roughly and irritated. Then all the animals were parathyroidectomized. The result was a disturbance of metabolism with a marked increase of sensitivity of the vegetative nervous system, more apparent in the roughly treated subjects than in the petted ones. Seventy-five per cent or the former died within 48 hours after the operation. Of the latter, eighty-two per cent survived.

Crile (24) puts on the same level, as regards their destructive action on the endocrine glands, overwork, infections, and such emotions as fear, hate, jealousy, shame, despair. He gives microphotographs of the histological changes produced in the glands and in the cerebellum by these harmful psychic tensions.

No one has ever broadcasted with such enthusiasm as Louis Berman (8,9,10,11) the advent of what he calls, in real American fashion, a "new" science. His books are typical pieces of popular scientific literature where the dogmatism of sweeping statements is in direct ratio with the lack of well-controlled experimental evidence. Even in his truly more scientific paper, "Crime and the Endocrine Glands", published in the American Journal of Psychiatry in 1932, and followed by an imposing list of bibliographical references, we read such doctrinal statements as these: "Modern studies of the quality

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of human constitution and personality have established their inheritance through the genes in the chromosomes of the protoplasm. It has also been demonstrated that these genes act through the endocrine glands of internal secretion. A wealth of evidence has established these two laws of constitution." (8, 220). Unfortunately for the reader who is eager to see a wee bit of that "wealth of evidence", the monumental bibliography appended to the article does not give the slightest indication as to where to find it.

Rich (86) is more guarded in his assertions. He simply states that in the acid-base equilibrium and creatinine production, it would seem that at the present time sufficient observations, obtain by various methods and from various points of view, are now at hand to enable us definitely to relate both of these chemical factors to the individual's emotional excitability. The more excitable individual tends to have a less acid saliva and a less acid urine. Excitable persons tend to have the lowest concentration of creatinine in the blood and the smallest relative amount of excretion of it in the urine.

However, the interdependence between glandular equilibrium, metabolic balance, and temperamental stability remains a postulatum generally accepted. The old humoral doctrine contained the same assertion couched in the scientific terms of centuries ago. The fundamental assumption is more diversified in its expression to-day, because biology has branched out into numerous disciplines. Let us now turn to an other one of these, neurology.

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Adrenaline, as we saw in a previous chapter (p. 29), "extraverts" the schizophrenic. But adrenaline does also stimulate the sympathetic nervous system. The antagonistic action of the sympathetic and the parasympathetic is well known to physiologists. If these two sections of the affective sensori-motor nervous system are in perfect equilibrium, we have a well-balanced individual; if one is constitutionally more active, we have either the vagotonic or the sympathicotonic type.

Kempf (58) contends that the evolution of the autonomic apparatus may be considered as the determining factor of the projicient apparatus (58, 4). And this factor remains the underlying principle of all behaviour, because in the autonomic system originate the basic avertive and acquisitive cravings of the organism. These cravings create a state of tension which co-ordinates the cerebro-spinal apparatus and compels it to act so as to expose the receptors of the organism that they may acquire certain types of stimuli and avoid others. The autonomic will also raise or lower the threshold of stimulation of the various receptors, so that they will be affected by certain stimuli at the exclusion of others. The various affective cravings become conditioned early in life, and indifferent stimuli will produce feelings of anger, fear, etc. in one subject, while they will arouse the very opposite emotions in another. When a craving is satisfied, the tension is relieved. When the tensionrelieving stimulus has exhausted the needs of one segment of the autonomic apparatus, it counterstimulates the antagonistic segment. which now co-ordinates the whole organism in a reverse attitude.

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This eventually produces a state of equilibrium and rest. Such alternances are easily noticeable at every moment. For instance you drive your car, and you meet with an accident. Fear and its natural expression will quickly turn into anger at the other driver or at yourself, and you will be tossed about by antagonistic feelings until you resume your psychical equilibrium, either by giving your feelings full satisfaction, or by letting them wear out each other.

Now, individuals vary in this respect. In some the parasympathetic will be more easily aroused; in others, the sympathetic. The former are vagotonics, the latter sympathicotonics. And here we come back to pharmacology and endocrinology. "Under the conception of vagotonia", writes Eppinger (31, 13), "we include all these constitutional conditions in which, in addition to the manifestations of an increased tonus of the vagus and increased irritability in this anatomical system, there also exists a condition of increased sensitivity to pilocarpine...... We may add as further earmark of the vagotonic disposition a relative decrease of reactivity to sympathetic stimuli."

No systematic experimenting has been done that I know which would rate individuals according to their reactivity to pilocarpine or acetyl choline on the one side and adrenaline on the other. A systematic study of a group of subjects as regards the condition of glands acting with either segment of the autonomic system has not been done either. But the results recorded in this chapter and in the previous one increase our conviction that the needed links between the psychological methods and the physiological means of in-

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vestigation are likely to be found before long. But it seems still too early to lay down definite basal types. The duty of the psychologist is to pursue his own research, without losing sight of the advances made in neighbouring fields. There are reasons to hope that all investigators, physiologists, neurologists, endocrinologists, pharmacologists, and psychologists, will eventually agree on a bimodal division of temperaments. We may safely assume that it will have something of the Jungian introversion-extraversion classification. Chapter VII

RECENT INVENTORIES AND QUESTIONNAIRES

"In the humble opinion of the writer", writes S. D. House (52, 22), "Professor Woodworth inaugurated a revolution in academic psychology when he innocently launched his 'Personal Data' research, or, as it has been more graphically termed, 'A Psychoneurotic Inventory'".

Woodworth's list of 116 questions, published in 1917 and intended to sift out the emotionally unstable soldiers from the U. S. Army, was the parent of the numerous questionnaires and inventories which have been used since then for the purpose of measuring nonintellectual traits. It originated from about 200 presumably psychoneurotic symptoms or traits culled from various sources, and it remained, in its multiple improved forms, v.g. House's "Mental Inventory", a means of detecting and measuring psycho-neurotic maladjustments. But many of the same traits were also included in questionnaires published in the last decade and designed to measure introversionextraversion. As a consequence of their origin, all these questionnaires have a tendency to confuse emotional instability and morbid introspection with normal introversion, thus leaving the innate constitutional tendencies in a bundle with neurotic or educative deficiencies.

Freyd (34) collected from several psychologists of standing and from graduate students in psychology lists of what they considered the traits of the introvert. There was considerable agreement among the contributors, which proved that they had all derived from psychological and psychiatric literature a fairly identical concept of the two Jungian types. Thirteen traits out of fifty-four were expressed in nearly the same terms as in Woodworth's "Personal Data Sheet". Heidbreder (43) worked Freyd's list of traits into a questionnaire. Each item was rated with a+when the subject was recognized to possess it, by a - when he was thought to have the opposite, and by a ? when the rater was in doubt. Three copies of the questionnaire were given to 600 students in general psychology. On one copy the subject was to rate himself, on the other two he was to secure ratings from two other persons. From all the papers returned 600 were chosen, giving ratings on 200 individuals, 100 men and 100 women.

The two main results were: a) that the scores were distributed according to the general form of a normal probability curve, extreme introversion and extroversion being at each end; b) that all traits but six formed a set of reactions which were consistent with each other, and which, taken together, defined a fairly definite attitude.

But there was no outside criterion against which the scores obtained on that scale could be checked, and the considerable number of psychoneurotic traits left on the list are apt to lend to introversion an appearance of abnormality. This might explain why the zero point of the scale was shifted on the extrovert side.

There is a distinct improvement in Laird's Cl questionnaire, (63) due to the fact that he made it possible for the subject to give his answer on a three or four point scale, ranging from a negative to a positive attitude. But his purpose was mental hygiene, his test was

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avowedly developed from Woodworth's Psychoneurotic Inventory, and, as a consequence, his type of introversion was anything but healthy. As a matter of fact, his schedule Bl (psycho-neuroid) was found by Hoitsma (48) almost twice as reliable as his schedule Cl (introversion-extroversion).

That test of Laird's, known as the Colgate Test, underwent various changes. The last one on record, C5, was the work of R. H. Whitman (113). The scale was shortened to 10 traits which are scored on a 10-point line. It is intended to give a quick, cheap, yet fairly accurate measure of introversion-extroversion, sufficiently reliable for group testing. But it is in no wise freer than the original C2 from the tendencies towards an unhealthy type of introversion.

Conklin (19) took care not to base his questionnaire on any abnormal characteristic. His assumption was that in normal introversion-extraversion individual differences are "due to differences in individual interests, or, to put it more exactly, they are due to differences in the content and essential nature of the conditions habitually controlling attention." (19, 28). His method of diagnosis consisted in presenting a list of 40 proposals in the infinitive form, v.g., to play baseball, to hear a lecture on classical music, to visit an automobile show, etc. They had been experimentally selected from a first arbitrary list of 100; 20 of them had been statistically determined to be significant extraversion traits, and 20 had similarly been found to be introversion characteristics.

He obtained coefficients of reliability of .92 and even higher. He found a low correlation coefficient with intelligence (from .05

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to .32), which seems to indicate that the test is actually measuring individual differences in behaviour conditioned by patterns quite other than those functioning in intelligence tests.

Oliver (77) administered the Conklin test to 39 subjects, of whom 21 were in the 10-percentile and 18 in the 90-percentile of a distribution of 181 subjects made according to Laird's inventory. The difference between the mean scores of the two groups was 19.8, with a probable error of 5.0; for the male subjects taken separately it was 26.2 with a probable error of 5.3. This would prove that the two tests, Laird's and Conklin's, although based on very different assumptions and having a rather low correlation coefficient, have nevertheless in common a few elements which could be sorted out and kept in a definitive test of introversion-extraversion.

Neymann and Kohlstedt (73) noticed that introversion or extraversion is a decisive factor with regard to the incidence of a psychosis of either of the two contrasting groups of mental disorders: scizophrenia and manic-depressive insanity. Their test consisted in 100 statements which had no implication of right or wrong. Fifty of them were assumed to please extroverts, and fifty were assumed to please introverts. This original tests was standardized on 100 cases of schizophrenic and 100 cases of manic-depressive patients, and brought down to the fifty most significant statements. The patients were given the test by experimenters who did not know the clinical diagnosis, and yet, the results of the two methods of investigation, i.e. psychological testing and psychiatric examination, coincided in 93 % of the cases. The real failures amounted to 1 % only, the remaining 6 % being cases of ill-defined reactions.

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A cursory inspection of the scores obtained reveals a distribution in the form of a bi-modal curve, both for the abnormal cases studied and for a group of 200 normal individuals chosen at random.

Bernreuter (12) assumes that the behaviour of an individual in a single situation is symptomatic of several traits and not of a single one. These several factors must be influencing the behaviour in varying degrees, which must be determined by a method of differential evaluation. He selected 125 items from all the questionnaires published to date, and he determined the diagnostic value of each item for a single trait by comparing the responses made by groups of subjects composed of individuals who were extreme deviates in each psychological trait investigated, viz., neurotic tendency, self-sufficiency, introversion, and dominance. But the high positive correlation (.96) between the scales of introversion (B 3-I) and neurotic tendency (B 1-N), and the comparatively high negative correlations (-.72 and -.83) between the scale of dominance (B 4-D) and the two former show that Bernreuter has not succeeded in singling out four distinct traits. He writes: "On the basis of the Personal Inventory test, it seems probable that neurotic tendency and introversion taken in the B 3-I sense are names given to a single trait whose real nature has been obscured by the inadequacies of the tests by which it has been estimated." (12, 402). In other terms the spectre of Woodworth's Psychoneurotic Inventory is still casting its shadow upon normal introversion.

Cattell (17, I) made a preliminary list of 28 traits and their opposite which are usually regarded as expressing either introversion (17 traits), or schizothymia (19 traits), or inferiority

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complex (17 traits), or anal-eroticism (20 traits). From these figures we see that the overlap was considerable. Eighteen more traits more generally associated with perseverance, conscienciousness, cheerfulness, originality of ideas, tact, etc., were added for good measure, bringing the total to 46 pairs of well defined characteristics. Sixtytwo subjects were rated by 4 judges, every possible care being taken to obviate the common sources of errors. An elaborate statistical treatment of the results brought the traits into four groups, of which only two are of special interest to us, the "Surgent-Desurgent" temperament group, which bears much resemblance to the extrovert-introvert types, and the schizothyme-cyclothyme group, which depends upon the influence of a factor working over and above the mere temperamental factor. The temperament factor is called the "c" factor, after Garnett's "cleverness" (36), and the cyclothymic factor is called "a", meaning adjustment. The surgent temperament, i.e. the individual scoring high on "c", is characterized by high cheerfulness, sociability, quickness of apprehension, impulsiveness, and originality.

Cattell devised various objective tests for the purpose of determining experimentally the degree of surgency. In spite of his enthusiastic conclusions concerning the diagnostic value of some of these tests, it seems difficult to accept them as dependable instruments of further research. Their correlation with "c" is rather low, as it may be seen in the following table:

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Test.	Reliability.	Correlation with "C".
Speed of reading	0.93	0.61
Psychogalvanic reflex (all deflections)	~ ~ ~ ~	0.31
Speed of writing	0 .85	0.30
Speed of Cognitive output	0.57	0.30
Rate of oscillation (ambiguous figure)	0.85	0.23

This last result contradicts McDougall's and Ewen's, for here the greater rate of oscillation goes with surgency, the correlate of extraversion, while in the experiments related in chapter V it went with introversion.

It happens that another investigator, Stagner (99), studied also the possible relationship between one of the tests used by Cattell and introversion. He found that speed of writing does not differentiate introverts and extraverts in any noticeable degree.

"When a problem is so involved that no rational formulation is available", writes Thurstone (104, 224), "then some quantification is still possible by the coefficients of correlation or contingency or the like. But such statistical procedures constitute an acknowledgment of failure to rationalize the problem and to establish the functions that underlie the data."

The failure to establish the functions that underlie the scores obtained by the questionnaires and inventories which have been examined is evidenced by the low coefficients of correlation between the various scales as well as by Bernreuter's frank admission that after much travelling we have come back to where we started, namely to Woodworth's Psychoneurotic Inventory. Conklin's Study of Likes and Dislikes is the only serious attempt to keep clear of the confusion between introversion and neurotic self-centeredness, while Cattell's laborious analysis gives some indications that some other factor or factors, which he calls "adjustment" and "maturity" are operative in making dissimilar in their behaviour two equally introverted or extraverted individuals.

It was left for E. C. Menzies to rationalize the problem. From his experience as a psychiatrist certain formulations have emerged which, far from being contradicted by the findings of psychologists who have accepted them tentatively, have rather proven to be useful in vocational guidance, psychological practice and research.

"Every individual", writes Menzies (72, 4), "can be placed somewhere on a scale which has at its extremes two clearly marked, definite and diametrically opposite temperamental types". The nearer the individual is to the center of the scale, the greater are his chances of remaining mentally same. The extremely closed type is a candidate to schizophrenia, as the extremely open type is of mania and depression. But how do people, who suffer from no congenital feeblemindedness, whose position on the introvert-extravert scale continuum is within a safe distance from the center or even on the center itself, develop nervousness, neurasthenia, hysteria, addiction to drugs, problems of conduct, and even severe cases of insanity, when neither physical trauma nor infection is present to explain it? By the action of another factor, which, for want of a better appellation, Menzies

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calls "maginfication of self". It does not mean over-valuation of one's own abilities. It describe people to whom their feelings and their emotions are very precious, people who suffer intensely whenever there is any insult or injury to their emotional life. And, in order to diagnose an individual's position on the temperamental scale, it is imperative to take out of the inventories every question that refers to emotional instability and not to normal introversion. It is also important to distinguish between introversion and morbid introspection which is the intellectual component of the magnification of self.

In order to test the value of the above theory, Menzies and Webster separated in Bernreuter's inventory the questions which they judged to be manifesting temperament from the questions which the took as indicative of magnification of self. Forty-four subjects were tested. The answers were scored three different ways, a) they were weighted according to Bernreuter's key, b) they were weighted according to the experimenters' own rating, c) they were left unweighted, i.e. each answer counted for one. The correlations between Magnification of Self (M. S.) and Bernreuter's Introversion (B 3-I) were as follows:

> Scoring a)..... 0.886 Scoring b)..... 0.76 Scoring c)..... 0.72

But the correlations between Magnification of Self and Temperament as outlined by the experimenters were quite different:

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Scoring	a)	0.72
Scoring	ъ)	0.00
Scoring	c)	0.00

These results were interpreted as indicating that Bernreuter's B 3-I scale, as it is weighted, is indeed a measure of neurotic tendency, but that it contains real temperament traits which, once sorted out and weighted from a different point of view, would yield different results.

With questions culled from Bernreuter's inventory and from various other such scales, Webster prepared a Personal Questionnaire of 90 questions, 45 for introversion-extraversion and 45 for Magnification of Self. There were only two answers possible, "yes" or "no". This tentative test administered to 40 men of age ranging from 18 to 50 gave a correlation of only 0.362, with a P. E. of 0.092 between temperament and M. S. There are reasons to believe that these figures would have been even lower, had the test been given exclusively to young people, as it was intended to be.

This first questionnaire of Webster's has since been modified in two ways: a) by dropping questions which were statistically proven to be of no evident diagnostic value; b) by adding a four-point scale on which the subjects may graduate their answers. This scale was first used on the M. S. section only, and later on the whole questionnaire. The results are yet to be published. In the meantime, Menzie's theory has helped solve many problems of vocational guidance and psychological advising.

In spite of its value, the Menzies-Webster Personal Questionnaire remains open to criticism, as all questionnaires are and will

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probably ever be. It does not place the subject in an actual situation, but requires him to imagine it; it makes no allowance for distortion of self-perspective due to compensation, repression, bad memory or general lack of self-knowledge (I); it presupposes complete honesty.

Most psychologists realize the unavoidable artificiality of tests, questionnaires, and even experiments, when it is question of gauging a person's temperament and character. Vernon (108, 104) advocates a systematized and controlled interview as the best substitute for the never-to-be-attained ideal, which would be the personal observation of the subject's reactivity in ordinary life over as long a period as possible.

In the following chapter we shall propose a method of diagnosing temperament which is hoped to be the best substitute for a lifelong observation of the subject.

(I) For instance Stagner (99) found that introverts rate themselves slower on decision and higher in co-ordination, while actual tests give opposite results.

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Chapter VIII

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EXPERIMENTAL GRAPHOLOGY AND TEMPERAMENT.

Repeated informal interviews, where the artificiality of laboratory situations is carefully avoided, are undoubtedly a good practical procedure for the trained psychologist who wants to form a mental picture of the personality of a subject. But the impressions obtained in interviews are fleeting; the mental picture committed to memory is easily dimmed, distorted, or rationalized in the course of time. Notes that were taken and results of actual tests may help revive it to a certain extent, but such fragmentary bits of information fail to give a permanent and strictly objective record of the subject's total reactivity.

Moreover, interviews are seldom repeated at long intervals, and they are unavoidably restricted to one section of the subject's life, or to a few sections taken in the course of a relatively short period. The consequence is that they give the psychologist a very limited view of personality. The research worker, who has none but such data to analyze, is likely to be frustrated in his hope to determine with scientific accuracy the fundamental traits buried under the accretions of life experience, passing moods and emotions, physical impediments, and physiological conditions.

Handwriting is crystallized gesture, it is the static record of the writer's dynamism, as it evolves under the influence of en-

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vironment, age, and accumulated experience. All through life we leave such records behind us. Some of them are written in perfect solitude, away from momentary disturbances, varied like our moods, and yet permanent in their general traits, as our very personality itself. In them the investigator has a vast amount of material for leisurely and thorough research. He may repeat his analyses; he may correct them as his knowledge develops; he may submit the same strictly objective records to his confrères.

Being so life-like, the graphological record is most complex. Saudek (96, 235) gives a list of twelve factors which he considers responsible for the formation of letters in the script of normal individuals.

- "1. The mechanical means (pen, ink, pencil, paper).
 - 2. The degree of graphic maturity.
 - 3. The degree of speed of the act of writing (actual intensity of the stroke-, letter-, word-, or sentence-impulse).
 - 4. The school-copy from which we first learned to write.
 - 5. The nationality of the writer, and also the national environment in which he is at present living, or has previously lived for any length of time.
 - 6. The individual degree of visual impressionability.
 - 7. Power of graphic expression (conditioned by the visual memory and manual dexterity).
 - 8. The degree of the writer's vanity, affectation and desire to imitate others on the one hand, or his naturalness and unaffectedness on the other.
- 9. Degree of cultivation, knowledge of foreign languages,

foreign styles of handwriting, and foreign countries.

- 10. The acute physiological condition of the writer.
- 11. Chronic physical impediments.
- 12. The circumstance of the position of a particular letter in the word or in the line."

These factors never work independently, nor with the same intensity. If we figure all their combinations possible, taking into account the varying degrees of their action, we reach fantastical figures. For instance, the most simple digit, "1", could, according to Crépieux-Jamin (22, 50), be written in

857 560 950 925 227 457 643 187 200 different ways!

It means that if we attempt to measure all the peculiarities of a particular script, we shall never be finished accumulating figures. On the other hand, graphology, as it is too often practised by self-styled character-analysts, is almost entirely devoid of scientific precision. And it is no wonder that, until June Downey published the results of her investigation in that field, graphology was considered as a mere parlour-game by most psychologists. The professional graphologists themselves objected to the intrusion of scientists in their domain. Meticulous measurements, they thought, would make one lose sight of the general indefinable features of handwriting, which one cannot see unless one is endowed with some mysterious faculty of second sight. This made the psychologists all the more exacting in their desiderata; character traits had to be clearly defined. their graphic signs had to be measured with ruler and protractor, and correlations had to be calculated. The haziness of the definitions on the one hand, and the crudeness of the methods on the other

were bound to beget misunderstanding.

In these recent years both groups are improving their methods, and they are gradually coming nearer each other.

Harvey (42, 310) wants to be impartial as regards both the claims of graphologists and the criticisms of psychologists, and he starts afresh the whole investigation. He adopts a most complex measurement of the length of letters, the size of angles, of spacing, etc. He calculates complicated ratios between some of his raw scores, and he throws big heaps of figures into the magic caldron of statistical witchery. His method is justly criticized by Jan Meloun (70), on the ground that it was based on the false notion that there is a special virtue in starting to measure without any previous thinking as to what is worth while measuring. In spite of that self-imposed handicap, he obtained results which corroborate to some degree the principles set down by the graphologists of the experimental school.

Some characteristics have already been singled out of the personality complex by experimental graphologists, and the reliability of their graphic expression is beyond all reasonable doubt. For instance Saudek (97) sorts the handwritings of honest and dishonest people with nearly 100 % success. Downey's first method of rating temperamental qualities (viz., explosive and inhibited make-up) by means of graphological signs, was recognized by herself to be faulty on many counts, but it did yield encouraging results (26, 105 and 125). Later (4, 233) she made graphological analyses of 23 subjects, and on that sole basis she determined what their rating ought to be on the Neymann-Kohlstedt test of introversion-extroversion. For introversion the correct matching was 83 % better than chance, for extroversion it

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was 11 %. Unfortunately, the validity of these results cannot be verified, because Powers, who relates them, does not give the graphological cues which Downey used to establish her diagnostic.

In an experiment conducted in the McGill Psychological Laboratory, in March 1934, I purposed to determine the degree of agreement between personality traits as revealed in a psychological analysis and the same traits as manifested by graphological signs. Twenty subjects were studied. They were interviewed by a psychologist and rated on a five-point scale as to introversion-extraversion. The were also required to write on unruled paper a short essay on "Extracurricular activities". These specimens were studied by the experimenter as to their graphological signs revealing the degree of introversion or extraversion of the writers. Primary slowness, as described by Saudek (96, 81), was taken as a sign of introversion; and primary speed, of extraversion.

The probability of perfect agreement between the psychologist and the graphologist was apparently 1/5; but, owing to the almost total absence of extreme cases, it should rather be considered between 1/3 and 1/4, nearer 1/3. The actual agreement was perfect in 9 cases out of twenty, and within one point of the scale in 19 cases. This seems to be more than a chance occurrence. The coefficient of contingency was found to be 0.31, when the coefficient of perfect contingency would be 0.817. The result becomes more significant when we pay attention to the fact that the norm followed in the psychological rating was by no means a very precise one. The psychologist readily admitted that his interviews with the subjects were of too short a duration, and that, as a consequence, his judgments were far from being irreformable as regards the degree of temperamental ten-

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dency. Therefore, agreement within one point of the scale could be interpreted as a sign of common tendency in both ratings. And, since the experimenter had not even seen the subjects, his evaluation of their degree of introversion or extraversion was considered as an indication that graphology might have some value in diagnosing temperament.

This preliminary work was the starting point of further research based on the following considerations and experiments.

"Every activity of the organism," writes Bechterev (7, 111), "is the resultant of two factors: the specific stimulus issuing from the environment, and its inner conditions, which represent the sum of the given individual qualities, consisting in turn both of qualities which are inherited and such as have been acquired through life experience".

Of the two last groups of qualities mentioned by the Russian reflexologist, the inherited and the acquired, it seems reasonable to presume that the former are the less easy to modify, both in their nature and in their graphic expression.

But have the inherited qualities any graphic expression? Is it possible, in a specimen of handwriting, to disentangle them from the characterological phases impressed upon the movement by the pressure of environment and experience? Since handwriting is a learned process, is it not probable that uniformity of graphic signs, imposed upon the children from the very first moment they trace their first bars and loops, will draw an impenetrable veil upon their budding personality? No. We have solid experimental proofs of the contrary. Crépieux-Jamin (22, 2 sq.) went into a kindergarten, and, at his suggection, the teacher required a group of children of from 4 to 5 $\frac{1}{2}$ years of

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age to trace in pencil on unruled paper a row of straight downstrokes and a row of "p"s. Each and every specimen collected had an unmistakable stamp of individuality. One month later the experiment was repeated. The signs of individuality had remained; it was easy to match the two copies of the same child taken at different times, but impossible to confuse the scripts of two different pupils. Yet, they were all learning to write from the same teacher, according to the same method, and from the same school copy.

Crépieux-Jamin anticipated an objection: is it not because of their lack of training that very young children have so individualistic a handwriting? Will they not, as their muscular coördination improves, imitate more perfectly the calligraphic model put before them and thereby lose their graphic individuality? Careful experimentation gives a negative answer to these questions. Crépieux-Jamin detected and showed individual variations in the writing of more advanced pupils, even when they were being taught that most impersonal type of handwriting called the "simple script" (22, 16).

Saudek (95) admits that on the average we may expect to come across identical handwritings once in about 10 000 cases. A close examination of the samples he gives in support of this theory induces one to think that the occurrence is much less frequent, for one specimen is distinctly more ornamented than the other. We may therefore conclude that identical scripts due to the pen of different persons are extremely rare.

But what of people whose handwriting changes constantly ? Such a change is more apparent than real. Saudek (96, 160 sq.)

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reminds us that it is practically nil in the case of small inconspicuous letters, and he has no difficulty in establishing the identity of even 12 different scripts submitted by one who for years and years had practised how to change at will his whole system of writing.

Left-hand writing, foot-writing, and mouth-writing (96, 205-211) show the same signs of individuality.

The writer made a simple experiment in order to find in what degree one may change at will certain characteristics of one's handwriting. He copied in his natural handwriting and at his usual speed 15 lines dictated from a book written in his own language. Then he noted the following characteristics, slant, size of letters, letters simple or flourished, pressure, connection or disconnection within words, which he decided to change in a definite way. He practised the artificial features one by one until he found that he had mastered them perfectly. The next step was to write the same passage, trying all the while to produce simultaneously the 5 features different from those of his usual handwriting. The speed was maintained normal.

The change in the slant was apparent and lasting.

The change in the height of letters remained quite constant for more than half the artificial specimen, but it eventually showed a tendency to disappear.

The writer had to make a distinct effort to summon a visual image of a flourished letter. He practised that change as much as the others, but, when the time came to put into practice his newly acquired art, his attempts at graphic ornamentation were utter failures.

The normal pressure was light; the artificial, heavy. But it started decreasing insidiously from the very second line of the

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second specimen. In the middle of the eighth line the writer evidently woke up to the fact that he was growing remiss in his purpose to keep pressure heavy; he resumed leaning on his pen, but he came back to a relatively light pressure in line 14. A new resolution to press hard seemed to have been taken at that stage, and it was carried on fairly well to the end.

In the first specimen the writer had showed a definite tendency to stop within words to write the accents when required. He had also lifted his pen after the letter "q", and he had done it in a very personal manner. The former habit was fairly well overcome in the second specimen, but the latter remained practically unchanged. Out of 16 "q"s, 14 were left without any connection with the following letter. Two were linked to the word in an awkward manner, and the angle made at the extremity of the lower projection was not at all in keeping with the general type of handwriting.

The conclusions were:

1. It is impossible to change simultaneously five characteristic signs in one's hanwriting, when speed is maintained.

2. Some signs are more easily altered than others.

3. Strikingly individual signs are more difficult to change than others. They seem to be an integral part of the writer's reactivity.

4. In order to succeed in effecting a change one must first form a visual image of the type to reproduce.

5. The small-sized letters are not so easily changed in a permanent manner as the medium-sized or the large-sized.

6. Slant is the most easily modified of all signs studied in the present experiment. In the course of a long piece of artificial writing, all the other signs are bound to reappear.

7. Their order of reappearance would be as follows: connection or disconnection (except in the case of one who has been trained to both script and connected handwriting), simple or flourished letters, pressure, size of letters.

From his experiments, Freeman (115) inferred that a great variety of adjustments performed in the act of writing are never fully nor explicitly recognized by the writer. Writing would never be exempt from a certain automatism.

As a conclusion we may say that graphic expression, although controlled in a large measure by the higher centers of the cortex and therefore modifiable at will, is nevertheless dependent upon some constitutional substratum which lies deeper than the dynamic levels amenable to training. Where is that center which resist all conditioning? Bror Gadelius writes (35, 282) that clinical experience " strongly supports the assumption that the mimic reflections of our emotions has its substratum in the same bodies (the subcortical ganglia), and that the chief of these, the thalamus, probably encloses or at least stands in immediate contact with the emotional centres in the mesencephalon".

Leaving aside the physiological problem, the writer is now investigating the graphic signs of temperament in the following manner:

1. He is collecting samples of handwriting taken at different ages in the life of as many subjects as possible, before and after graphic maturity, as well as after the incoming of senescence. If there is such a thing as an inherited and permanent temperament, and if temperament manifests itself in handwriting, some identical signs should be visible all through life.

2. He has already accumulated a fairly good collection of samples of handwriting due to the pen of schizophrenic and manic-depressive patients. Specimens written before the apparition of the psychosis are unfortunately difficult to obtain.

3. After Heymans' manner, he is studying a group of historical and notorious per sonages whose autographs are available in the Redpath Library. The purpose is to correlate their script with their temperament as revealed in their biographies.

4. He is continuing the experimentation mentioned above, matching his ratings on temperament based exclusively on graphological analysis with those of psychologists who study a certain number of subjects for vocational guidance or other purposes.

SUMMARY AND CONCLUSION

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Among the various constituents of personality, temperament is generally recognized as that something inborn and permanent which has always been linked with some individual physiological characteristics.

The classical doctrine admitted of four temperaments, the sanguine, the choleric, the melancholic, and the phlegmatic, each corresponding to one of the four humours of the human body. That theory was left practically unchallenged until the beginning of the present century. It is now superseded by new ones, which differ in their manner of linking fundamental psychological differences with bodily constitution. Some appeal to biochemistry, some to neurology, some to endocrinology. But all are in fairly constant agreement in considering temperament as a factor whose variations could be distributed on a continuum, ranging from an extreme type to the opposite extreme. The two contrasting types are given various names, but Jung's appellation of introvert and extravert seems the most widely used nowadays, and there is no reason not to accept it for the time being.

Among the means of diagnosing temperament now in use - psychophysical methods and questionnaires - many are valuable, but none has yet proven to be so perfectly reliable as to rally the suffrages of all investigators.

The writer proposes experimental graphology as an avenue to

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further research in this field. He bases his project on the recent findings of scientific graphology, on theoretical assumptions which contradict no psychological law universally accepted, and on his own preliminary experimental work on the problem.

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