A MEDICO-PSYCHOLOGICAL ACCOUNT, FOLLOWED BY A DEMONSTRATION OF A CASE OF SUPERNORMAL APTITUDE

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It gives me great pleasure to have this opportunity to address you once again, and more especially because this time it is not in my capacity as General Secretary! That is not to say that the secretarial work was not pleasant; on the contrary, there was even a lot of fun in it, on occasions. For instance, I am sure none of you knew that under Dutch law this Congress is subject to entertainment tax!

Or that in some countries, as one of the participants has informed us, foreign exchange for travelling expenses to attend this scientific congress could be obtained only if the gathering could be classed as one devoted to sport or games? Then there was the difficulty of replying tactfully to some of the enquiries; for instance, that from a gentleman who wanted to know if the five guilders congress fee covered the cost of board and lodging; and how to compose an index-file when some of the learned gentlemen absent-mindedly forget to fill in their application forms and send them in, in a state of purest virginity?

However, don't let us worry about these congressional puzzles, which have all been solved by now. Tonight I will set before you another puzzle; a scientific one this time: the problem of the partial supernormal ability.

Before proceeding to the demonstration announced in the program, I will briefly summarize the results of an experimental-psychological examination which extended over the years 1941 to 1943, of two brothers – WILLIAM and LEO –, one of whom was deported during the war never to return. WILLIAM is the surviving brother.

The two brothers' mathematical powers comprise an enormous memory for figures (for instance, memorizing and reproducing numbers consisting of up to two hundred and four figures), and astounding manipulations with numbers, of which more by and by. They also had at their disposal a remarkable range of factual data.

To explain this extraordinary aptitude, we may look at the matter from different angles; for example:

Are these accomplishments based on an exceptional, inborn general memory; and is there such a thing as a specific memory for numbers? As regards their general memory, exhaustive tests made in series showed, that the two brothers' general memory did not surpass the average. These tests included the memorizing of letter-sequences, of meaningless syllables and of texts from belletristic works.

Neither did I feel justified in assuming the presence of an exceptionally developed specific memory. I found, on the other hand, that, in memorizing numbers, the two brothers tried to utilize the peculiar properties of the figures and numbers, and this convinced me that their memory was of the logical type.

The next question was, did the two brothers have an exceptional interest in numbers as such? To answer this question, I carefully collected as many anamnestic data as possible. From considerations of time, I will content myself with citing the following bare facts. WILLIAM wrote figures and numbers even before he ever went to school; at from seven to nine years of age, his hobby was to add up the figures in any price-list he could lay hands on, and break up numbers into fractions by way of recreation. From the allo-anamnestic data I may mention that one of his fellow-pupils told me that WILLIAM, when at college, was always working at figures during lessons in any subject whatever.

The collected anamnestic data altogether convinced me that there must have been a strong innate interest in figures as such.

A third question was, whether practice and repeated exercises played an important role. Now this is an element rather difficult to define. Maybe it can be clarified by reference to the distinction, first made by OTTO SELZ, between "einsichtigem" and "uneinsichtigem Lernen", and by classing repeated practising under the heading of "learning without insight". It may me asserted, of course, that a person who is always busy with figures cannot help becoming more skilful, in the long run, in manipulating them.

G. E. MUELLER, who examined the arithmetical genius RUECKLE, and whose method of investigation I largely followed for the sake of control and comparison, regards the practice factor as the most important. I cannot agree with this conclusion, for the following reasons. Firstly because WILLIAM himself told me that repeated exercise does not always result in more rapid calculation, and secondly, because his brother LEO never practised at all intentionally (in contrast to WILLIAM), and yet attained a tremendous speed in performing his mathematical feats.

While the average person does not reach any exceptional pitch of accomplishment by the mere act of practising, it did lead both WILLIAM and LEO to the discovery of a new method, about which more anon. Former investigators, as MUELLER and KROH, give prominent place to repeated exercise, and second place to inborn aptitude.

A fourth interesting question was whether WILLIAM and LEO were predominantly disposed either visually or acoustically. To assure myself on this point I made six different series of experiments, on the same lines as those which MUELLER made with his subject RUECKLE. The first of these six series concerned the interchanging of mutually resembling elements. We first tried to find whether the two brothers, in any mistakes they might make during memorizing, confused mutually resembling

optical elements. This, in fact, was the case with LEO, but not with WILLIAM. Secondly, series of consonants were given them to memorize; first an arbitrary series, then a series which might easily be confused optically, and finally a series of elements having no optical resemblance but only an acoustical. It was shown that WILLIAM mixed up acoustically similar elements, and LEO optically confusable ones.

The second series served to determine whether memorizing was hindered by vocal music. To this end, we – that is, two assistants and myself – intoned a monotonous tune close to the subject's ear. These pretty bad-sounding melodies acted as a hindrance in WILLIAM's case; in LEO'S, hardly at all.

The third series of tests showed that WILLIAM is a good "introspector" while LEO was not. The test was as follows: I gave them nine words chosen at random, to memorize both visually and acoustically, and afterwards asked them in what way they memorized them; whether they created some mental image for themselves, and whether they remembered the place of the word on the paper. An important point in this questioning is also the extrospection; that is, do the subjects, while memorizing the words, consonants or figures, make bodily movements, lip-movements, etc.? It was noticed that WILLIAM made pantomimic expression movements: while memorizing, his torso, arms and legs move rhythmically; he shakes his head and moves his lips. LEO, on the contrary, would remain sitting or standing completely rigid as he listened to the task set him or stare at the paper before his eyes. It was also clear from their introspective communications – however scant they were – that LEO's method was predominantly visual, whereas WILLIAM's mnemic type is strongly acoustic-rhythmic-motorial.

A fourth series of tests consisted of giving the subjects sequences of numbers which were read to them in a certain way, and to be reproduced in another way, as follows:

A number consisting of twelve figures was presented to them acoustically in sets of three, in order to determine, first, the reproduction time when they repeated the numbers in the same way, that is, in sets of three; and second the time they took to repeat the figures separately. The difference in the time of reading was, of course, taken into account, since it was longer in the first case than in the second.

After this, a number of twelve figures was read to them in sets of three as before, but they were to repeat it, first in separate figures, and after this, in sets of three.

Then, a number of twelve figures was read to them in separate figures, the subjects being asked to repeat it, first in separate figures, and then in sets of three. Next, this procedure was reversed.

Finally, a number of fifty figures was presented in the same way, the number being split up into ten sets of five figures each, and afterwards presented again in separate figures, the subjects to repeat the total number in alternate sequences.

When the transformation takes a long time – as was the case with WILLIAM – then this points to a predominantly acoustic-motorial type of memory; in the case of LEO it hardly took any time at all, which shows that he was predominantly visual.

The fifth series consisted of reading aloud a number of English words which had to be repeated in different ways; first, by pronouncing them in accordance with the English pronunciation; for instance, the word "claim"; second, according to the spelling as if it were a Dutch word: Kla-im, and third, by spelling the word: c-1-a-i-m.

Now when there is only little time-difference in the reproduction of the word, this shows that the subject, as it were, sees the word "in his mind's eye" and just reads aloud what he sees in front of him. This was the case with LEO. With WILLIAM, the time-difference was considerable.

The sixth series was aimed at determining whether the subjects converted the sequences presented acoustically, into visually perceived ones. To this end we made a number of control tests.

First, combinations of figures were presented (according to RANSCHBURG) in different colours; second, figure combinations were indicated in long sequences; third, the subjects were asked to memorize numbers and consonants written in different colours; fourth, to memorize twelve Roman figures – the reproduction time being compared with that of twelve Arabic ones. After this, I made some tests according to JAENSCH. (By this time, LEO, poor fellow, had already been deported.) These tests, made with WILLIAM alone, turned out negative.

All these experiments showed that WILLIAM belongs to the acoustic-rhythmic-motorial type and LEO to the visual. The conclusion is highly interesting; namely, that this phenomenal capacity for memorizing figures is quite evidently not conditioned by a particular mnemic type.

To pass now to the fifth question; that is, the method which the brothers evolved to arrive at their extraordinary skill, we have already mentioned the innate aptitude and interest which we gathered from the anamnestic data. The development took the following course. At school, the brothers learned how to break up a number into its component fractions. They immediately applied this operation. Possibly their aptitude is constitutional, and seeks after a way to deploy itself. This is accompanied by an elevation of mood, which in its turn leads to a tendency to "show off" their skill. WILLIAM, for instance, was fond of giving an exhibition of his cleverness at parties, etc.

The method of breaking up numbers into fractions that does not particularly impress most people, for WILLIAM turned out to be a complete revelation. The remarkable thing about a mathematical genius is the fact that he follows a definite method in solving his problems; he suddenly discovers, rather in the way of KOEHLER's "Aha!-

Erlebnis", or the "Oh, I see!" reaction, that a knowledge of the peculiar properties of numbers can be applied to the performance of still greater and more rapid mathematical feats.

It is not to patient and zealous practice that the mathematical prodigy owes his skill; for, as we found, practising with letters does not lead to greater skill in memorizing. But figures have certain definite properties; an individuality, as it were. That is the reason why the two brothers had comparatively little difficulty in memorizing them. If one asks why it is that WILLIAM is able to multiply better than most people, the answer is, not through practising, but by having found a special method. It would lead me too far to describe the various admirable methods he evolved, e.g. with the aid of logarithms; but it is the method that is most important; the mastery of the properties of the figures is coupled with elevation of mood, and this aids the mathematical prodigy both in rapid calculation and in memorizing.

G. E. MUELLER was of the opinion that the mathematical genius need not possess an especially capacious memory, and that such an individual's feats of calculation are to be explained exclusively by his extraordinary interest in figures and by constant practice. This conception, in my view, is wrong; and this has been proved in our case, by LEO's performance; he was perfectly indifferent to arithmetics, and never practised in his life. The method, in fact, is based on an extraordinary insight into the properties of figures and numbers.

A final question is, what are the influences which lead a person to train himself into-developing so one-sidedly? It will be seen that, while native talent must be present, there must also be some exogenic factor playing a part in the process. The question, whether the subject's special interest is inborn, leads us to the next point: The general psychological factors. I cannot here speak at any length about the personal facts of the lives of the two brothers; nor give you the results of our extensive and detailed structure-analytical examination; I will content myself with stating that WILLIAM feels a certain psychic insufficiency. His natural interest in figures is stimulated by his having evolved a method of fractioning, and it is, of course, possible that by zealous industry and practice he may succeed in acquiring a slightly greater speed in manipulating numbers. LEO also had this feeling of insufficiency to some degree. It would be wrong, however, to regard their extraordinary accomplishments as a successful effort at overcompensation – although there is a possibility that this factor did play some part within the total process.

To sum up, the process took the following course: there was an inborn receptiveness; this determined the subject's interest; this interest is directed at an aim, leads to the discovery of a method, and this method leads to the ability which results in the accomplishment.

Our seventh and last question is, whether the performance may be influenced by exogenic factors; or whether the method is, indeed, the most important factor of all; or whether there are other important factors, such as – to use an atomistic term – an exceptionally developed power of combination or conceptive speed. To this end we

made a series of experiments with drugs. By this time LEO had already been deported. In these tests, drugs were used that tend to enhance intellectual activity. First, a series of tests with pervitin (desoxyephedrin), up to six pellets; second, caffein (as much as from 300 to 450 milligrams), and third, cardiazol (up to a 50 mg., a few times in succession!).

In these tests, serious account has to be taken of the factors of practice and fatigue, and of the after-effect of the drug. Many control tests were therefore necessary.

As regards the pervitin tests, they were made on nine successive Mondays. The results were invariably the same, that is, a distinctly noticeable somatic effect; as regards speed, there was a difference in the time of making "easy" sums, while that of the difficult computations showed a slight slowing down.

Other intellectual work, such as BOURDON's test, took a much longer time after the administration of pervitin, and the subject made many more mistakes. So we see that automatic intellectual action recedes; in other words, ordinary arithmetical work is hardly influenced by the drug; other mental activity, on the contrary, very considerably.

My conclusion in that arithmetical calculation does not depend so much on greater working speed, close concentration, great accuracy, or proneness to fatigue on the part of the individual; rather do we see that the method previously evolved is the most important factor. In this method he has attained an optimum; this finely differentiated scientific work can only suffer by the administration of a drug, because it upsets the subject's psychic balance:

As regards the caffein tests, these, too, were repeated in series, as many as six times. The results were exactly the same as those of the pervitin tests. Only BOURDON's test was done more rapidly after the administration of the drug, but this has hardly any integrating significance.

And the results of the cardiazol tests were precisely the same. It must be concluded from all this that it was with the method that optimal efficiency was attained.

I should like to conclude with two interesting control-checks.

1). I made WILLIAM calculate according to a method different from the one he was used to, and with which, therefore, he was unable to achieve optimal results. This was the multiplication method employed by his brother LEO. I further asked him to memorize sequences of figures -- not according to his usual method, that is, in sets of three, but in sets of four. I saw at once that this caused a considerable slowing down of the process. I then passed him through a series of tests, repeated up to five times, and after the administration of pervitin, caffein, and cardiazol, respectively. Between every

two series, an afternoon session was inserted, at which the same tests were made without the drug. This time, the computation was enormously accelerated after the drug was administered. The practice factor was eliminated in these control-tests by the following means: first afternoon, a series of sums without the drug, followed by a series with the drug, which was done at a far greater speed. Second afternoon, a series without drug, followed by another series, also without the drug. The latter showed hardly any increase in speed; this proves that the practice factor does not play a significant part.

2). The second control-check was made with the aid of hypnosis. According to the method of the contrasting action of colours, WILLIAM was put into the hypnotic state, and suggestions were put to him to the effect that his mathematical accomplishments were going to be greatly enhanced and intensified. (In the beginning, the subject showed a certain resistance). I refrain from referring here to his introspective experiences. He was first given a number of calculations to do, according to his own method, after which the suggestion of greater proficiency was put to him. There was hardly any improvement or acceleration at all. Tests were then made with sums which he was to do with his brother's method. It was seen that, there, considerably greater facility was displayed than in the waking state, although there was no increase in speed.

The method is and remains the principal factor. I may mention by the way that these tests revealed the presence of a remarkable contrast. Subjectively, WILLIAM found that in the hypnotic state "every thing was going on as in a slow film", whereas, objectively, a far greater speed was attained; this under the influence of the artificially effected narrowing of consciousness, and the enhanced concentration of attention.

We may conclude from these hypnotic experiments that – just as in the case of the drugs – the performance is not improved when a method is used by which an optimum had already been reached previously. Other mental factors which might perhaps play a role are therefore hardly significant.

Once again: the method is and remains the chief factor in explaining the great speed of calculation and the subject's enormous mnemic accomplishments.

I thank you.

Now I am very sorry to say that my subject Mr. WILLIAM, has failed to turn up. This man originally studied medicine, passed his examinations, and as we say in English "walked the hospitals", but eventually chose to demonstrate his mathematical skill at country fairs rather than his medical proficiency.

Anyway, when you read through your program on some future occasion, you will no doubt have some idea of the extent to which Mr. WILLIAM has let us all down.

The mathematical prodigy WILLIAM should demonstrate the following experiments:

A. Memorizing tests:

Numbers up to 20 figures, to be reproduced, and again 25 minutes later.

B. Mental arithmetic:

1. Multiplication.
2 numbers, of 2, 3, and 4 figures, respectively. Squaring numbers from 3 to 8 figures incl.

2. Addition.
20 numbers of 2 figures; 15 numbers of 3 figures; 10 numbers of 4 or 5 figures.

3. Evolution (extraction of roots).
Example: $\sqrt[8]{73}$; $\sqrt[13]{184}$

4. Compound interest.
Example: *f* 19.— invested in the year 1358 at 3% compound interest yields, in 1946, *f* 674.000.000.—.

5. Calendar dates.
Example: Someone was born on Oct. 7th., 1909; on what day of the week did this date fall? On a Thursday. On Dec. 31th., 1945, he was 13234 days old, or 317,616 hours, 19.056.960 minutes, or 1.143.417.600 seconds!

6. Division.
Examples: 32817 : 53 = 619, rest. 10.
627.809 : 349 = 1798, rest 307.

C. Calculations, partly mental, partly on the blackboard.

1. Multiplication.
2 numbers, each of 8 figures; Involution: squaring a number of 12 figures.

2. Fractioning.
Numbers of at least 8 figures.

We, orthopedagogues, after all, ought to be accustomed to life's disappointment; this was, indeed, something like a miscalculation! WILLIAM may not be an intellectual defective, but the fact that he left our Congress in the lurch shows that he is able to demonstrate his partial ability also in other, more general and especially moral, ways.

We shall now put PETER through his paces. Come along PETER! PETER has remembered all the factual data of one thousand clergymen, that is their names, their initials, year of birth, when they were ordained, the year they arrived in their parish, when they retired or died; their ranks and even the numbers of their banking accounts and their telephone numbers.

This experiment takes place as follows:

One of the audience calls out a number corresponding to the data of one of the priests. The leader of the experiment thereupon tells PETER the name, after which PETER will write the remaining data on the blackboard, i.e.,

1. The initials of the clergyman in question.

2. A number consisting of 4 groups of 2 figures:

    a. the first 2 figures represent the year of birth, the century being omitted;

    b. the next 2 figures represent the year the priest was ordained;

    c. the next 2 figures represent the year the minister arrived in his parish;

    d. the last 2 figures represent the year of retirement or death of the clergyman.

    All these data must be taken with a grain of salt, that is what PETER is a defective for after all!

3. Certain Christian names which have a symbolic meaning:

    "Jozef" means Died.

    "Rinus" means Rector.

"Dorus" means Dean.

"Evert" means Retired.

"Ko" means Chaplain.

"Kees" means very young Chaplain.

"Paulus" means very aged Priest.

"Piet" means Priest.

4. Name of station of parish.

5. Number consisting of 6 figures.
This represents the number of the respective clergyman's postal transfer account, his banking account, or his telephone number.

PETER, who in his youth desired to become a priest, has an exceptional interest in the clergy. He belongs to the visual mnemic type; he sees the clergyman in question before him in his mind's eye as soon as he hears the name. He got his data from old "In Memoriam" cards. These he arranged into a most complicated, compulsive-neurotic system, the discussion of which would lead us too far on this occasion.

In addition to the above, PETER knows countless data of other persons in public life; the times of departure and arrival of aeroplanes; opening and closing hours of chemist's shops; personalia of the fire brigade and police, and all kinds of numbers of railway and tramway rolling stock.

PETER's accomplishments cover a very wide range of feats of memory, so if any of you would like to employ him instead of the airlines time-table, please let the Secretariat know!

Meanwhile I see that time is getting on and I propose, Mr. Chairman that we now pass on to the next item on the program.