

Hence, the synesthetic experiences that clearly made themselves felt when he recalled a voice, individual sounds, or complexes of sound were not of major importance but served merely as information that was secondary in *his recall of words*. Let us consider S.'s responses to words now in greater detail.

WORDS AND IMAGES

As we know, there are two aspects to the nature of words. On the one hand, words are composed of conventional groupings of *sounds* having various degrees of complexity—the feature of language phonetics deals with. On the other hand, words also designate certain objects, qualities, or activities; that is, they have specific *meanings*—that aspect of words with which semantics and other related branches of linguistics, such as lexicology and morphology, are concerned. A person in a healthy, alert state of awareness will generally not notice the phonetic elements in words, so that given two words such as *skripka* and *skrepka* (Russian: "violin" and "paper clip"), which differ by virtue of one minor alteration of vowel sounds, he may be completely unaware of their resemblance phonetically

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and observe only that they stand for two completely different things.*

For S., too, it was the meaning of words that was predominantly important. Each word had the effect of summoning up in his mind a graphic image, and what distinguished him from the general run of people was that his images were incomparably more vivid and stable than theirs. Further, his images were invariably linked with synesthetic components (sensations of colored "splotches," "splashes," and "Ones") which reflected the sound structure of a word and the voice of the speaker.

It was only natural, then, that the *visual quality of his recall* was fundamental to his capacity for remembering words. For when he heard or read a word it was at once converted into a visual image corresponding with the object the word signified for him. Once he formed an image, which was always of a particularly vivid nature, it stabilized itself in his memory, and though it might vanish for a time when his attention was taken up with something else, it would manifest itself once again whenever he returned to the situation in which the word had first come up. As he described it:

*It is only in certain pathological states that the phonetic elements of words predominate and meaning becomes unimportant. See A. R. Luria and O. S. Vinogradova: "An Objective Investigation of the Dynamics of Semantic Systems," *British Journal of Psychology*, L, No. 2 (1959), 89-105.

When I hear the word *green*, a green flowerpot appears; with the word *red* I see a man in a red shirt coming toward me; as for *blue*, this means an image of someone waving a small blue flag from a window . . . Even numbers remind me of images. Take the number 1. This is a proud, well-built man; 2 is a high-spirited woman; 3 a gloomy person (why, I don't know); 6 a man with a swollen foot; 7 a man with a mustache; 8 a very stout woman—a sack within a sack. As for the number 87, what I see is a fat woman and a man twirling his mustache.

(Record of September 1936.)

One can easily see that the images produced by numbers and words represent a fusion of graphic ideas and synesthetic reactions. If S. heard a word he was familiar with, the image would be sufficient to screen off any synesthetic reactions; but if he had to deal with an unfamiliar word, which did not evoke an image, he would remember it "in terms of lines." In other words, the sounds of the word were transformed into colored splotches, lines, or splashes. Thus, even with an unfamiliar word, he still registered some visual impression which he associated with it but which was related to the phonetic qualities of the word rather than to its meaning.

When S. read through a long series of words, each word would elicit a graphic image. And since the series was fairly long, he had to find some way

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of distributing these images of his in a mental row or sequence. Most often (and this habit persisted throughout his life), he would "distribute" them along some roadway or street he visualized in his mind. Sometimes this was a street in his home town, which would also include the yard attached to the house he had lived in as a child and which he recalled vividly. On the other hand, he might also select a street in Moscow. Frequently he would take a mental walk along that street—Gorky Street in Moscow—beginning at Mayakovsky Square, and slowly make his way down, "distributing" his images at houses, gates, and store windows. At times, without realizing how it had happened, he would suddenly find himself back in his home town (Torzhok), where he would wind up his trip in the house he had lived in as a child. The setting he chose for his "mental walks" approximates that of dreams, the difference being that the setting in his walks would immediately vanish once his attention was distracted but would reappear just as suddenly when he was obliged to recall a series he had "recorded" this way.

This technique of converting a series of words into a series of graphic images explains why S. could so readily reproduce a series from start to finish or in reverse order; how he could rapidly name the word that preceded or followed one I'd

select from the series. To do this, he would simply begin his walk, either from the beginning or from the end of the street, find the image of the object I had named, and "take a look at" whatever happened to be situated on either side of it. S.'s visual patterns of memory differed from the more commonplace type of figurative memory by virtue of the fact that his images were exceptionally vivid and stable; he was also able to "turn away" from them, as it were, and "return" to them whenever it was necessary.*

It was this technique of recalling material graphically that explained why S. always insisted a series be read clearly and distinctly, that the words not be read off too quickly. For he needed some time, however slight, to convert the words into images. If the words were read too quickly, without sufficient pause between them, his images would tend to coalesce into a kind of chaos or "noise" through which he had difficulty discerning anything.

In effect, the astonishing clarity and tenacity of his images, the fact that he could retain them for years and call them up when occasion demanded it,

* S.'s technique of a "graphic distribution" and "reading" of images closely resembled that of another mnemonist, Ishihara, who was studied and written about in Japan. See Tukasa Susukita: "Untersuchung eines ausserordentlichen Gedachtnisses," *Japan Tohoku Psychologica Folia*, I, No. 2-3, and II, No. 1, Tohoku Imperialis Universitas, Sendai, 1933.

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made it possible for him to recall an unlimited number of words and to retain these indefinitely. Nonetheless, his method of "recording" also had certain drawbacks.

Once we were convinced that the capacity of S.'s memory was virtually unlimited, that he did not have to "memorize" the data presented but merely had to "register an impression," which he could "read" on a much later date (in this account we will cite instances of series he reproduced ten or even sixteen years after the original presentation), we naturally lost interest in trying to "measure" his memory capacity. Instead, we concentrated on precisely the reverse issue: Was it possible for him to forget? We tried to establish the instances in which S. had omitted a word from a series.

Indeed, not only were such instances to be found, but they were fairly frequent. Yet how was one to explain forgetting in a man whose memory seemed inexhaustible? How explain that sometimes there were instances in which S. *omitted* some elements in his recall but scarcely ever *reproduced material inaccurately* (by substituting a synonym or a word closely associated in meaning with the one he'd been given)?

The experiments immediately turned up answers to both questions. S. did not "forget" words he'd been given; what happened was that he omitted

these as he "read off" a series. And in each case there was a simple explanation for the omissions. If S. had placed a particular image in a spot where it would be difficult for him to "discern"—if he, for example, had placed it in an area that was poorly lit or in a spot where he would have trouble distinguishing the object from the background against which it had been set—he would omit this image when he "read off" the series he had distributed along his mental route. He would simply walk on "without noticing" the particular item, as he explained.

These omissions (and they were quite frequent in the early period of our observation, when S.'s technique of recall had not developed to its fullest) clearly were not *defects of memory* but were, in fact, *defects of perception*. They could not be explained in terms of established ideas on the neurodynamics of memory traces (retroactive and proactive inhibition, extinction of traces, etc.) but rather by certain factors that influence perception (clarity, contrast, the ability to isolate a figure from its background, the degree of lighting available, etc.). His errors could not be explained, then, in terms of the psychology of memory but had to do with the psychological factors that govern perception.

Excerpts from the numerous reports taken on

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our sessions with S. will serve to illustrate this point. When, for example, S. reproduced a long series of words, he omitted the word *pencil*; on another occasion he skipped *egg*; in a third series it was the word *banner*, and in a fourth, *blimp*. Finally, S. omitted from another series the word *shuttle*, which he was not familiar with. The following is his explanation of how this happened:

I put the image of the *pencil* near a fence . . . the one down the street, you know. But what happened was that the image fused with that of the fence and I walked right on past without noticing it. The same thing happened with the word *egg*. I had put it up against a white wall and it blended in with the background. How could I possibly spot a white egg up against a white wall? Now take the word *blimp*. That's something gray, so it blended in with the gray of the pavement . . . *Banner*, of course, means the Red Banner. But, you know, the building which houses the Moscow City Soviet of Workers' Deputies is also red, and since I'd put the banner close to one of the walls of the building I just walked on without seeing it . . . Then there's the word *putamen*. I don't know what this means, but it's such a dark word that I couldn't see it . . . and, besides, the street lamp was quite a distance away . . .

(Record of December 1932.)

Sometimes I put a word in a dark place and have trouble seeing it as I go by. Take the word *box*, for example. I'd put it in a niche in the gate. Since it was

dark there I couldn't see it . . . Sometimes if there is noise, or another person's voice suddenly intrudes, I see blurs which block off my images. Then syllables are liable to slip into a word which weren't there originally and I'd be tempted to say they really had been part of the word. It's these blurs which interfere with my recall...

(Record of December 1932.)

Hence, S.'s "defects of memory" were really "defects of perception" or "concentration." An analysis of them allowed us to get a better grasp of the characteristic devices this amazing man used to recall words, without altering our former impressions with respect to the power of his memory. Upon closer examination, these devices also provided an answer to our second question: Why was it that S. evidenced no distortions of memory?

This last could be explained simply in terms of the synesthetic components that entered into his "recording" and "reading" of memory traces. As mentioned earlier, S. did not just transcribe words he had been given into graphic images: each word also furnished him with "extra" information which took the form of synesthetic impressions of sight, taste, and touch, all of these aroused either by the sound of a word or by images of the letters in the written word. If S. made a mistake when he "read off" his images, the extra information he had also

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registered would not coincide with the other characteristics of the word he had reproduced (a synonym, perhaps, or a word closely associated in meaning with the correct word). He would then be left with some sense of disharmony that would alert him to his mistake.

I remember once walking back with S. from the institute where we had been conducting some experiments with L. A. Orbeli. "You won't forget the way back to the institute?" I asked, forgetting whom I was dealing with. "Come, now," S. said. "How could I possibly forget? After all, here's this fence. It has such a salty taste and feels so rough; furthermore, it has such a sharp, piercing sound..."

The combination of various indications which, owing to S.'s synesthetic experiences, provided him with additional information on each impression he had registered operated to guarantee that his recall would be precise, or made it highly unlikely that he would come up with a response that would differ from the word he had been given.

DIFFICULTIES

Despite the advantages S. derived from having spontaneous visual recall, his was a type of memory that had certain drawbacks as well, a fact which became all the more apparent when he was forced