B. F. Lomov

PSYCHOLOGICAL PROCESSES AND COMMUNICATION

When psychological functions and processes first became the object of concrete-scientific study (particularly experimental studies), investigators saw their main objective to be to determine the laws and characteristics of these processes in their pure form. Experimental methods were aimed at isolating a given function (perceptual, mnemonic, intellectual, etc.) as completely as possible from the system of other psychological phenomena and reducing to a minimum the influence of these other phenomena on the function under study, which was then investigated as a kind of unique natural property of the individual.

In this sense, in the first (analytic) stage of the development of experimental psychology, psychological functions and processes were viewed abstractly. Experimental studies determined the dependence of the dynamics of these processes and functions on the specific features of the material being dealt with by the subjects, on the conditions of the tasks or problems with which they had to cope, on their attitudes, motives, etc.

But this dependency was regarded as the result of the influence of factors external to the processes themselves.

An important step in overcoming abstract functionalism was made by Soviet psychology in developing a theory of activity. Psychological processes and functions were now seen in relation to the real activity of the subject, which enabled investigators to discover their regulative role in this activity. Using this approach, investigators reviewed the entire — or almost the entire — system of psychological functions and processes. The development of sensory and perceptual processes, mnemonic functions, ideas, conceptions, and thought were investigated in the context of activity. The research done in this area is quite well known.

It should be pointed out, however, that in the majority of experimental studies of psychological processes and functions, only the relationship between subject and object is treated; and activity (chiefly practical activity with objects) is viewed as the activity of a discrete individual. The communication and interaction of this individual with others are not dealt with, though communication is an inseparable part of the realities of human life. Studies have shown that psychological processes unfold differently under conditions of communication from those we observe when we study individual activity.

In our opinion one of the most important conditions for developing further the theory of psychological processes is study of the dependence of their dynamics on the forms, methods, and means of communication.

Let us analyze the results of some extremely simple experiments aimed at determining the dynamic characteristics of certain psychological processes under conditions of direct communication in social interaction. (1) These experiments were based on the theoretical positions set forth in our other article. (2)

Of fundamental importance for our study was the organization of joint activity of subjects, which inescapably required them to communicate with one another. Small groups of two people (called dyads in social psychology) participated in the experi-

ments. The subjects were students and older schoolchildren.

The experiments were conducted under natural conditions (the subjects did not suspect that they were participating in experiments). Their verbal communication with one another was recorded on a tape recorder of which the subjects were unaware. Their behavior while coping with the tasks proposed to them was also observed. (3)

We carried out three series of natural experiments.

In one of them the subjects together engaged in a visual search for an object that was not readily noticeable (activity of observation).

In a second, we had them together draw a map of some locality.

In a third, they were to reproduce the text of a poem.

Some distinguishing features of the visual search for objects under conditions of direct communication (results of the first series of experiments).

In the activity of observation, the search for a perceived object plays the dominant role. Sometimes this activity amounts to nothing more than such a search, pure and simple. Studies in experimental psychology aimed at visual search taking place as an individual activity have revealed many essential characteristics of the dynamics of such a search and the dependence of these characteristics on the structure of the field of vision, the task at hand, and the strategy adopted by the observer to accomplish the task. Visual search turns out to be a complex process, comprising the delimitation of zones of search, the definition of systems of reference points, coordinates, and the formulation and testing of hypotheses (B. G. Anan'ev, K. V. Bardin, V. K. Gaida, V. P. Zinchenko, T. P. Zinchenko, A. A. Mit'kin, V. F. Rubakhin, etc.).

In our study we attempted to examine the dynamics of visual search under conditions of joint observation. (4-5)

Groups of two people, each observing a picture of city life under natural conditions, were requested to find some inconspicuous object with no special distinctive features such as its color or shape. The experiment was carried out as a game.

The instructions were given verbally (the object and its distinctive features were named). Sometimes subjects were given drawings that reproduced either the shape or the color of the object or both together. We were interested in seeing how the process of communication among the subjects unfolded during the course of this joint observation.

The task was carried out in several versions.

In some cases the subjects found the assigned object independently of one another and almost at the same time. They talked with one another only to check each other's results, to compare samples, as it were. But these cases were rare and occurred only when the task was sufficiently simple for both subjects.

In other cases, in which the task was difficult for both subjects, communication between them virtually pervaded the whole process of search. The subjects defined common points of reference, sometimes agreed to divide up the field of search, and marked out a general strategy. During the course of joint observation they would offer hypotheses, correct and test them together, and define their model more precisely. But such cases were also rare in our experiments.

The most typical kind of joint search (in a task of medium difficulty) was one in which one of the subjects (let us call him A) found the assigned object earlier than the other (B) and began to talk with his partner in order to help him. Through speech and gestures A would begin to guide the attention of his partner, narrowing down the area of search and shortening its trajectory.

The chief objective of the first stage of communication was generally joint definition of common reference points, and it was by no means always the partner who had already found the object who staked out the reference points: sometimes it was the partner who had not yet found the assigned object. Usually it was things that were distinguished by their color, shape, or position within the field of joint search that were singled out as reference points. Sometimes subjects would take similar objects (but not the same ones) as reference points. This would

cause disagreements in the joint search and difficulties in the exchange of models.

Once the common reference points were determined, subject A would begin to construct (dictate) the direction of search for subject B. In doing so he would never attempt to convey to subject B the same direction of search he himself had traversed. (6) Already knowing where the object was, A would construct a new trajectory (which in his view was the most efficient) and would convey this to his partner. In regulating the search operations of subject B, subject A would not only indicate the position of the sought-after object relative to the common reference points (i.e., the direction of search) but would sometimes also formulate certain procedures for employing these operations. (7)

If A had arrived at a wrong result, his partner would usually discover this. Then both subjects would return to their model, revise it, and begin a new cycle of joint search. In other words, the combined search also included mutual correction of models.

The search culminated in coordination of perceptual models and reaching a joint decision.

In discussing the kinds and means of interaction between the subjects in joint visual search, one should point out that speech communication in such an activity performs an auxiliary and subordinate function. Speech in such cases is situational; its vocabulary is sparse, and its structure is elementary. The chief means of communication under conditions of joint visual search is gestures. Three types of gesture may be distinguished: indicative, descriptive, and imitative.

An indicative gesture is employed to set the direction of the partner's glance and narrow his area of search, i.e., an indicative gesture is used as a means of regulating the selectivity of perception (discriminating a figure against the general background). It is noteworthy that in using an indicative gesture, a subject tries, as it were, to make his visual field congruent with the visual field of his partner (a gesture indicates direction relative to the partner's position).

A descriptive gesture is used as a means of reproducing the shape of some object (a reference point) and also to aid per-

ceptual selectivity (helping the partner discriminate the indi-
cated object).

Imitative gestures are used to regulate the trajectory of the
partner's search. They reproduce particular elements of the
trajectory and certain techniques for performing some visual
operation.

The expansiveness of the process of communication under
conditions of joint visual search depends on the complexity of
the task at hand and the degree to which the operations of the
partners are coordinated (and, above all, synchronized). The
more complicated the task and the less coordinated the opera-
tions, the more expansive is communication, and vice versa.

Some characteristic features of the dynamics of topographic
mental pictures under conditions of direct communication (re-
sults of the second series of experiments).

Studies of mental pictures as secondary sensory images dis-
closed a number of specific characteristics of such pictures
compared with perception. In empirical psychology a mental
picture was regarded as a faded copy of a perception; its chief
features were considered to be paleness, instability, incon-
stancy, and fragmentariness. But the work of Soviet psycholo-
gists has shown that the characteristics of a mental picture de-
pend to a considerable extent on the structure of the activity of
which it is a part (B. G. Anan'ev, L. M. Vekker, M. A. Dmitri-
eva, V. N Pushkin, and others). It has been demonstrated that
a mental picture is a generalized and collective image; the path
from perception to mental picture is marked by a certain sche-
matization of the image, and the word plays a central role in
the formation of these characteristics (B. G. Anan'ev, M. V.
Gamezo, V. F. Rudakhin, and others).

Two basic forms of topographic mental pictures have been
distinguished: a "road map" and a "survey map"; and it has
been shown that in a process of activity the first of these is
transformed into the second (F. N. Shemyakin). The qualities
of a panorama are typical for developed topographic mental
pictures (S. N. Vasileiskii and others).

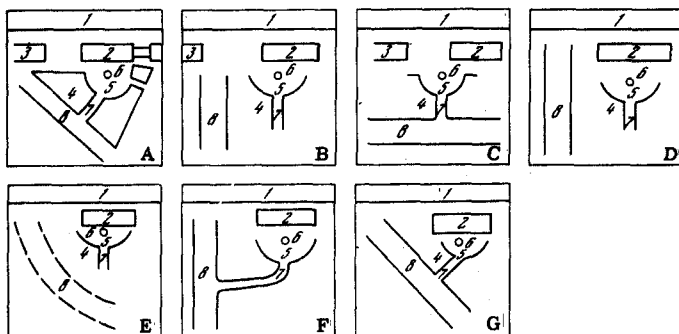Operation with mental pictures (the process of imagining)

Figure 1. Joint and separate drawing of a map of Palace Square.
A — map of Palace Square in Leningrad; B — map compiled by
subject A; C — map compiled by subject B; D, E, F — succes-
sive variants of the map compiled by the two subjects jointly;
G — final version of the map. 1 — Neva River; 2 — Winter
Palace; 3 — Admiralty Building; 4 — Headquarters of Chief
of Staff; 5 — Arch of Chief of Staff; 6 — Alexandrian Column;
7 — Hertzen Street; 8 — Nevski Prospect.

has also been studied; some of the operations employed in this
process have been delimited (transformation and scale, various
techniques, techniques of discriminating and combining the ele-
ments of an image); and the effectiveness of this process has
been found to depend on the degree of generalization, differen-
tiation, and flexibility of mental pictures.

Usually the dynamics of mental pictures has been studied
under conditions of individual activity. In this series of experi-
ments we attempted to trace out certain dynamic characteris-
tics of topographic mental pictures under conditions of direct
communication.

The subjects were asked to sketch a map of the Winter Palace
Square in Leningrad and its surrounding areas. A task like this
did not require a high level of graphic skills. The subjects in
the experiment were people who either lived in Leningrad or

visited it frequently. First, the assignment was given to each
subject separately, and then (after several days) the subjects
had to carry out the assignment together.

The following is an abbreviated and partially edited protocol
from one of the experiments (joint performance of the task).

Figure 1 shows the maps drawn by subjects A and B doing
the exercise separately (Figure 1B and 1C). As we see, both
maps contain obvious mistakes (Figure 1A shows the correct
map for comparison). In drawing up the map together, subject
A (who lived in Leningrad) took the leading role. He began the
drawing with the Nevski Prospect, and basically reproduced
his own original plan (Figure 1D).

> B (interrupting A): I don't understand what vantage
> point you're looking from.
>
> B: I'm going along the Nevski Prospect to the Admi-
> ralty.
>
> B: Oh... But I still don't understand. Where's the
> Arch? (meaning the Chief of Staff Arch).
>
> A: Here it is (indicative gesture).
>
> B: And how do you get to the Arch?
>
> A: Here's Hertzen Street (descriptive gesture).
>
> B: I don't understand. Hertzen Street is perpendicular
> to the Nevski Prospect.
>
> A: But the Nevski Prospect goes into the Admiralty,
> and behind it is the Neva (River). I'm going along here
> straight to the Admiralty (imitative gesture).
>
> B: Yes, I see that. But I don't understand how you're
> doing this. From the Arch you go straight to the Neva,
> and along the Nevski Prospect it looks like you can go
> straight to the Neva too... (jokingly) Maybe there are two
> Admiralties? Well, actually, here's the way it should
> be.... The Nevski curves a bit here (descriptive gesture,
> Figure 1E).
>
> A: Curves? What do you mean? The Admiralty isn't
> visible from the Moscow Railroad Station....
>
> B: There's a little trick here. From the Nevski Pros-

pect along Hertzen Street you end up under the Arch like
this (imitative gesture). Maybe Hertzen Street bends a
little bit here (descriptive gesture)?

A: Exactly. (Draws Hertzen Street, Figure 1F).

B: No, something's wrong. It curves, but only a little
bit. And it's very short.

A: I don't understand.

B: Well, the way it is is that the Nevski Prospect is at
an angle like this (descriptive gesture, then makes a cor-
rection in the drawing, Figure 1G).

A: Actually we can get to the Neva along Latvia Street,
too. But that's the long way; along Hertzen Street it's
shorter. Yes, that's the way it is....

In looking over the results of this series of experiments, the
first thing that strikes the eye is that the two subjects working
separately sketched wrong maps. So we put these two subjects
together in the same group. However, neither had any doubts
that his map was basically right (they had doubts only about the
details).

But under communicative conditions, what was wrong in both
maps was brought out, creating a problem situation and evoking
in each subject the need for communication. (8)

In the initial stage of communication the chief objective (as
in the preceding series of experiments) was to define common
points of reference (common coordinates). In the experiment
whose protocol is given above, A picked the junction of the
Nevski Prospect with the Admiralty as his first point of refer-
ence, whereas B picked the Chief of Staff Arch. Communication
was aimed at determining the interrelationships between these
two points. During the course of their communication, both
subjects offered hypotheses that they then checked together. It
is interesting that the correct solution was proposed not by that
subject who seemingly should have known the Palace Square bet-
ter (i.e., subject A, who lived in Leningrad), but by his partner
(subject B, who lived in Moscow); rather, the correct solution
was prepared in the process of joint discussion of hypotheses,

in other words, in the process of communication.

In cases in which both subjects drew up a map of a locality
that was, in principle, the same, communication was aimed at
increasing the accuracy of scale, the position of details, and
filling in gaps in the map. In these cases details were regarded
in terms of a common (i.e., accepted by both subjects) system
of reference points.

During this stage of communication, hypotheses were also of-
fered and tested, and either rejected or accepted by both subjects.

Since the subjects reproduced (with some mistakes) a map of
some locality in its entirety, we can call the topographic men-
tal pictures they had "survey maps." But in the process of
communication specific elements in the topographic mental
pictures were expanded upon, as it were, and the subjects
switched over to operating with a "road map," each subject
scanning the field in reference to a common system of refer-
ence points.

In dealing with tasks requiring the subject to invoke topo-
graphic mental pictures, the means of verbal communication
play a greater role than in joint visual search. In these cases,
too, however, the subjects made extensive use of gestures that
served as means, as it were, of externalizing their respective
mental pictures. Through gestures (especially descriptive and
imitative gestures) one subject opened the way to his mental
picture for the other subject (i.e., made it accessible to him). (9)

The mental picture of each subject was transformed in a cer-
tain sense, refined and enriched in the process of communica-
tion; and the end result of this was a unification or amalgama-
tion of the mental pictures of both subjects.

As the results of this series of experiments showed, the ac-
curacy and thoroughness with which topographic mental pictures
were reproduced were greater under communicative conditions
than under conditions of individual activity.

Some features in the reproduction of a poetry text under con-
ditions of direct communication (results of the third series of
experiments).

Soviet psychologists have devoted a considerable amount of attention to the analysis of processes of reproduction under conditions of individual activity (P. I. Zinchenko, L. V. Zankov, A. N. Leont'ev, A. A. Smirnov, and others). The characteristics of this process under conditions of communication have been considerably less studied. This series of experiments was designed to elucidate some of these characteristics.

In the preliminary study, each subject was asked individually to reproduce the beginning of the first chapter of Pushkin's poem Eugene Onegin. This first gave us a baseline from which we could work, and secondly enabled us to screen out those subjects who had only a partial recollection of the first chapter of the poem.

In the main study (several days after the preliminary study) groups of two subjects each were asked to reproduce the same material, but this time jointly under conditions of direct communication.

In both cases reproduction or recall was recorded by a hidden tape recorder.

In the case of separate (individual) recall, the classic picture, quite well described in the literature on memory, was observed: accurate recall of the beginning (and sometimes the end) of certain lines; substitution of certain words for others; rearrangement of some words, lines, and sections; presentation of the sense of a fragment instead of its literal recall; etc.

The situation was different in the case of joint recall, under conditions of communication. In this case a certain shift in roles, mutual correction, and joint search for forgotten words and phrases in connection with the formulation and testing of a hypothesis were observed. Here are some excerpts from the protocols:

A: And then he read Adam Smith and became a political economist...

B: No, I don't think that's the way it is. There's no such word as political economist, especially in Pushkin.

A: Something doesn't seem quite right to me either... But what is it?

B: It must be that he was some sort of an economist ...
and became some sort of economist ...

A: And became a scientific economist?

B: Maybe a "deep" ...

A: Yes, that's it! And became a deep economist, i.e.,
he was able to make judgments about ...

Both (in chorus):

> Kak gosudarstvo bogateet
> I chem zhivet i pochemu
> Ne nuzhno zolota emu
> Kogda ... ta-ta. ta-ta imeet.

> [How the state became so rich
> On what it lived and why
> It had no need of gold
> When it had ta-ta,ta-ta]

A: Some sort of product... Like in a natural economy ...
but what product?

B: Maybe direct, that is, no I don't remember.

A: Simple?

B: Of course.

Both subjects recalled this part of the line accurately. We
should point out that when recall was done separately, neither
subject was able to reproduce this part of the stanza accurately;
both presented it for the most part in prose.

Here is how subject A reproduced the stanza: "Then the verse
goes on to say that Onegin read Homer, Democritus, or some
other Greek ... and read Adam Smith. ... We also went through
Adam Smith, he read Adam Smith and then there was something
concerning evaluations of political economy. ..."

Here is how subject B reproduced the stanza: "He studied
Adam Smith ... and then there was something about that the state
or the government became rich and what it lived off of and why
it didn't need gold, when it had something ... and, er, his father

couldn't understand him and rented out his lands."

Neither of the subjects was able to reproduce this part of the stanza accurately without communication, although each did remember the sense. On the other hand, the entire stanza was recalled accurately after communication.

An interesting aspect of joint recall was the search for particular words. Some of the words found became key words in recalling the following part of the text. In searching for a particular word each subject offered hypotheses, which they discussed and corrected together. Here is an extract from a protocol. The subjects for a long time were unable to recall the part of the text in which the childhood years of Onegin are described.

B: Sperva mamam za nim khodila
   Potom starik ee smenil,
   Rebenok byl konechno, mil.

   [At first the mother looked after him
   Then the grandfather took her place
   He was of course a gentle child]

A: Something's not right. It does say that he was a gentle child, but there's something that stands in contrast. Oh, yes! Here it is: "The child was frisky but lovely."

B: Frisky? No, that's not the word.

A: But this was in the 19th century. I remember it for sure that the child was frisky but gentle.

B: O.K.; maybe it was frisky. But at the beginning we said something about the old man that wasn't just right. Then later on there's something about the gentle old man who used to take Onegin for a walk in the summer gardens. "And they went for walks in the summer garden."

A: Wasn't there some foreign word ... something about senior? Starik-sin'or ... ? No, it was French. The old m'sieu, and not maman but madam ...

B: That's it, m'sieu ...

A: That's it. And then there's again that problem about
the old man ... In my opinion this is the way it is:

Sperva madam za nin khodila
Potom mos'e ee smenil,
Rebenok byl rezov, no mil.

[At first the nurse would look after him
Then the old sir replaced her,
The child was frisky, but gentle.]

"The old man da-da ... a gentle Frenchman" ...
Well, let's repeat it.
   Both (alternating and supporting one another):
   A: At first the nurse looked after him,
   B: Then the old sir replaced her,
   A: The child was frisky but gentle.
   B: The old man ...
   A: L'abbé ... I remember ... the last name
   Both together:

Frantsuz ubogii,
Chtob ne izmuchilos' ditya,
Uchil ego vsemu shutya,
Ne dokuchal moral'yu strogoi,
Slegka za shalosti branil
I v Letnii sad gulyat' vodil.

[The gentle Frenchman,
So as not to torment the child,
Would teach him everything jokingly,
He did not bore him to death with strict
   moral lessons,
Would reproach him lightly for his
   mischief
And would take him walking in the summer
   garden.]

(The reproduction was close to the original: the word "m'sieu" replaced the phrase "old man.") A little later the subjects returned to this part of the text and reproduced it again, this time accurately.

One of the characteristic features of joint recall was that the total scope or volume of literally reproduced material was greater than the sum of the volumes reproduced by each of the participants separately. In addition, both the accuracy and confidence in the correctness of the recall were greater.

It would be wrong to present the results of recall under communicative conditions as the superimposition of what each subject had stored in his memory on what was stored in the memory of the other subject. This is demonstrated by the diagram in Figure 2. In the process of joint recall, what is first of all recalled is what is stored in the memory of both subjects firmly and accurately. These parts of the recalled material play the unique role of a kind of general set of coordinates (building blocks) and form a system of reference points with regard to which the rest of the material is recalled. An important aspect of the construction of such a system of reference points (in the given case, consistency of exposition, a logical line marking the beginning of the first chapter of the poem Eugene Onegin) is the mutual reinforcement and the mutual correction of the subjects with regard to the recalled material.

The basis for correction in joint reproduction was broader than for individual reproduction; a sort of a joint memory bank was formed, which both subjects used.

Aspects of recognition are also included in the recall process; these give a new impulse, as it were, to recall (A recognizes what B has recalled, and this recognition dredges new parts of the text up from his memory).

Also, processes of self-regulation are more active for each of the subjects under conditions of communication.

In joint recollection, mistakes and doubtful places, i.e., those parts of the material neither subject was able to recall accurately, are recognized more clearly than in individual recall. A clear distinction is made between what the subjects remem-
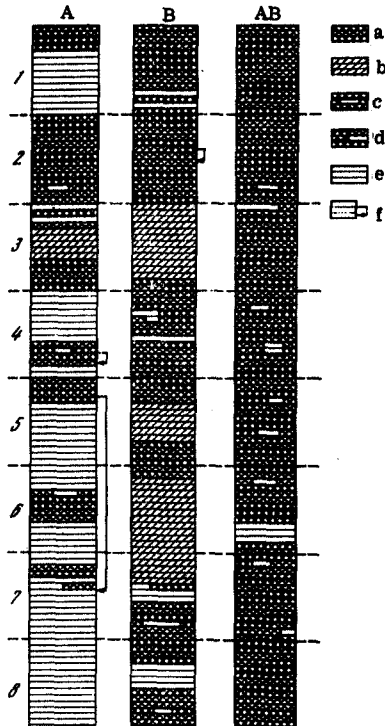
Figure 2. Diagram showing joint and separate recall of a poetry text.

A — recall graph for subject A;
B — recall graph for subject B;
AB — graph for combined recall.
a — correctly recalled lines;
b — lines whose sense was recalled;
c,d — omissions of individual words in recall;
e — unrecalled lines;
f — reshuffling of lines in recall.

bered well and what they were unable to remember or remembered or reproduced poorly and inaccurately. It was in these parts of the text of the recall material in which joint search for what had been forgotten took place. Of course, such a search also takes place in individual recall, but it is more intense in the case of joint recall.

We should also point out that the very strategy of search is different in a communicative situation. In individual recall, when subjects discover a mistake they usually return again and again to the beginning of the text (or stanza) and run through it anew each time. We might call this a scanning strategy. Often, when a subject uncovers a mistake, he is unable to correct it and gives up any further attempts at recall.

Under communicative conditions, such gaps (blocks in recall) become, so to speak, the focus of joint effort; and joint search

is organized with regard to them. We can call this focusing
strategy. The subjects uncover a gap and begin actively to offer
hypotheses, discuss them together, and correct them.

Reminiscence is more frequent in joint recall than in individ-
ual recall.

Finally, we should point out that, on the whole, the process of
joint recall of a text (like the map of a locality) takes place in
a more active and emotionally laden manner than does individ-
ual recall; and this is another factor contributing to its greater
efficiency.

*   *   *

The findings of our trial experiments enable us to say a few
things about the conditions, functions, and structure of commu-
nication, and about certain features of the dynamics of the psy-
chological processes constituting it.

As we saw, the most important condition giving rise to the
need for communication is the emergence of a problem situa-
tion. (10) This means that a problem (or task) arises for whose
resolution the knowledge, abilities, and skills of a single indi-
vidual taking part in a concrete activity are, for one reason or
another, insufficient.

The chief functions of communication (in our case) consist in
an exchange of the results of cognitive activity of each individ-
ual, mutual regulation and correction of the operations carried
out by each of them, and the formation, on this basis, of a joint
group, an aggregate subject of activity.

The dynamics (and structure) of the process of communica-
tion in each particular case is determined by the conditions
under which it takes place. The dynamics depend on the nature
of the task to be resolved, the individual characteristics of the
persons taking part in communication, and the interrelation-
ships that are formed among them (11), on who communicates
what, for what reason, and how, to whom.

The results of our study are still not sufficient to enable us
readily to propose a satisfactory structural model of the pro-

cess of communication. We should like only to point out the most important aspects of communication from our point of view. The first stage in this process is the determination of common "coordinates" of joint activity (reference points, reference models). These serve as a basis that, in a certain sense, guides the construction of the entire process of communication and the distribution and coordination of the operations carried out by each member of the communicating group. In the formation of these coordinates, contradictions sometimes arise that impede coordination of actions. (12)

The process of communication itself unfolds along a sort of spiral path: it involves an alternation of functions of each of the participants. The relationships among the participants are bilateral and mutually reversible.

Synchronization of the actions of each participant in communication and mutual stimulation, regulation, correction, and complementarity are all important aspects of communication.

The process of communication produces a common program and common strategy for joint activity. A strategy formulated in the process of communication is qualitatively different from an individual strategy.

In all the experiments, the effectiveness of combined coping with all the proposed tasks was greater than the effectiveness of individual activity. This is not a new finding in itself: it has long been known to social psychologists. (13) But our findings indicate that a necessary condition for increasing the effectiveness of communication is the formation of a special joint "fund" of conceptions, ideas, and techniques for dealing with particular problems, i.e., an interindividual psychological reserve.

In our experiments we studied psychologically different types of activity. In one of them sensory/perceptual processes (visual search) played the leading role; in another, processes of imagination (portrayal of a locality) was the major feature; and in a third, the emphasis was on mnenonic processes (reproduction or recall of a poetry text). Our findings indicate that the dynamics of these processes depended quite intimately on communication. Communication may be regarded as one of

the most important determinants of the dynamics of these pro-
cesses.

Finally, it should be observed that the interrelationship of the
different means of communication is determined by the kind of
task to be resolved. In some cases speech plays the leading
role; in others, it is gestures (especially in the case of tasks
that require spatial orientation or recall or reproduction of the
spatial features of objects). In communication associated with
the exchange of emotional states, imitation probably plays the
dominant role.

As we have said, our experiments are only preliminary. Our
findings should be seen merely as a framework within which
further studies may be planned and conducted. Much more ef-
fort is required to work out rigorous empirical methods, meth-
ods for concise description of empirical data, and models of
processes of communication.

Notes

1) A theory of communication and rigorous methods for study-
ing the dynamics of psychological processes in communication
have not yet been developed in psychology. This is a task for
the future. The studies we have described in this article are a
contribution to the solution of this task.

2) See this same book, pages 124 through 135.

3) Unfortunately, we did not have any means of accurately
recording the behavior of our subjects.

4-5) Unfortunately, we were unable to make use of any means
for accurate recording of the process of search (in particular,
the eye movements of each of the subjects).

6) As an analysis of the accounts of the subjects shows, they
usually were unable to reproduce the path of their individual
search completely, but they did reproduce quite accurately the
course taken in their joint search.

7) For a more detailed study of the characteristics of the
trajectory or pathway of search under communicative condi-
tions, it would be quite useful to do a comparative analysis of

the trajectories of eye movements in individual and combined search.

8) When the maps drawn by each of the subjects were identical (or almost identical), communication was terse and essentially confined to mutual confirmation of the identity of the maps.

9) A comparison of sketches of the actual actions in imitating gestures performed by the subjects shows that a gesture reproduced an operation only schematically and in a generalized form (findings of our colleagues D. Gaida and A. Charchani).

10) Of course, this is not the only condition. A need for communication also arises in connection with the need, for example, to alter an emotional state (the need for distraction) or a set of interpersonal relationships, or the need to organize joint activity, etc.

11) In our experiments we tried as far as possible to neutralize this factor by choosing subjects who could enter into joint activity on an equal basis with their partners.

12) The sources of these contradictions require a special study.

13) Of course, contrary findings have also been recorded in social psychology. The efficiency of joint activity evidently depends on many factors: interrelationships among its participants, the organization of activity, group structure, etc.