1. Basic criminalistic criteria of using a polygraph

Interrogation using a polygraph (IUP) is a new method of diagnostic investigation for Russian criminalistics.

During many decades of the XX-th century the Soviet jurisprudence had been considering the process of obtaining information from a person with the help of a polygraph as a pseudo-scientific method, and the use of a polygraph in law-enforcement practice was considered to be actually unacceptable. In 1993, according to the federal law on operational search activities (OSA), IUP was permitted for application, and since then it has been progressively used in the activity of law-enforcement authorities and other federal agencies of Russia.

In the beginning of the XXI-st century the competent authorities of the country used IUP in the law-enforcement activity (LEA), for personnel testing (screening) and for investigative practice (including procedural conditions). According to the estimated assessment for 2005, federal authorities of Russia conducted around 25 000 IUP of different purpose.

Introduction of IUP into domestic criminalistic practice have increased the range of efficient methods and means of prevention, detection and investigation of crime, and initiated a new trend in criminalistic technique dedicated to an objective diagnostic of crime traces kept in human memory.

Long ago, psychology, psychophysiology and neurophysiology have proved that the outside events are perceived by different receptors and fixed in the memory as different mental images. Particularly, the information received visually is transformed into a collective activity of many neurons as a result of activity of different brain structures, and these neurons form a neuron trace of any event in form of engrams, i.e. traces of memory formed as a result of receipt of some information about the event. Then this neurophysiologic reflection of a certain event fixed in the memory becomes a mental image of this event in the conscience of a person. When it is needed, a person extracts the information about this event from his memory and - with certain limitations and rather conditionally - it can be presumed that the person "reproduces" a corresponding mental image and then "reads" it from the memory, materializing it by oral or written communication, or by physical activity (for example, drawing a pattern or a picture). If some information is received through an acoustic analyzer, then, actually, the same process takes place: processing a wording, the human brain identifies meanings of the words, determines the sense and records it in the memory as a set of corresponding engrams.

As mentioned above, such rather simplified explanation - how a person perceives the events from the outside, fixes them in the memory and further reproduces them in the conscience - is directly related to criminalistics which distinguishes two classes of crime traces: materially fixed traces and "ideal" traces - mental images, impressed and kept in a human memory.

The criminalistic science have identified that "ideal" traces have three principle diversities in comparison with material traces: they are hidden from direct investigation; mental images are possible to examine only when they are materialized by a person possessing such an intangible trace orally or in written form; and materialized mental images are much more informative than material traces.

Evidently, an event (for example, a crime) initiates in psychics of different people different trace-generating processes and creates in their memory mental images which are quite different due to some primary subjective human factors. These factors are:

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a) conditions and circumstances of human perception of the outside world (crime);

b) physical and emotional state of a person;

c) his sense and social attitude;

d) his cultural and national individuality etc.

When a person reproduces (“reads”) an “ideal” trace from his memory the situation becomes more complicated, because the number of factors influencing the process of materialization of mental images is growing.

First of all, the primary subjective human factors mentioned above can react again, independently and, in total, unpredictably both for the person – image-carrier as well as for the outsider (for example, for the investigator). Second, forgetting is an objective factor resulting in a natural destruction of an “ideal” trace. And third, when an “ideal” trace is being materialized a secondary subjective human factor can be involved – the volition to deliberately falsify the mental image according to personal intentions, own requirements and reasons of a person. In other words, forming and materialization of an “ideal” trace depend on psychological characteristics of its carrier, i.e. of a certain person.

It is known that materially fixed trace can be destroyed by natural, man-caused and other exposure as well as by an intended destruction (deliberate elimination of crime traces by criminal).

In comparison with a materially fixed trace, an “ideal” one can be destroyed only by objective factor – by forgetting. But it can not be eliminated deliberately: a human being is not able to forget something knowingly (on purpose), to “erase” from his memory undesired events of the past or their separate circumstances.

This is the principle advantage of “ideal” trace over materially fixed one.

And this advantage makes conditional upon the effectiveness of IUP application for disclosure, investigation and prevention of crimes.

An “ideal” trace is fixed in human memory as engrams, i.e. a complex of structural-&-functional changes in a set of brain neurons. If human memory is correctly applied to, the engrams “are reactivated when required and become active. ...The reactivation can happen spontaneously, as well as under influence of different internal and external factors. The status of the engram (including its presence or absence in the human memory – author’s remark) can be evaluated only by test results”\(^3\), particularly, polygraph test.

Engrams of some event, of course, can not be directly investigated and can not be identified, however they are diagnosable in human memory. Such criminalistic diagnostics is based on the fact that activation of engrams is exhibited by the change of neuron activity of brain structures and is followed by response of physiological systems (for example, respiratory, cardiovascular, etc.). And these responses are externally registered by a polygraph during a specifically arranged testing procedure, i.e. during IUP.

Quite a number of events (or their separate circumstances) of his life are inevitably forgotten by a person. But, an emotional impression (for example, a crime) is fixed almost immediately and automatically in an emotional memory. The trace of emotional memory can not be erased and is not subjected to amnesia (forgetting). Corresponding engrams are kept throughout the entire life and make possible during IUP to diagnose effectively “ideal” crime traces hidden in the memory for 10-15 years, and even longer.

2. Brief characteristics and structure of interrogation using a polygraph

Research of a human memory by IUP for the presence or absence of “ideal” traces (mental images) of some event or their

deliberate falsification during materialization allows for the independent evaluation of the reliability of information which has been earlier communicated by this person to somebody and which was subjected to checking.

Nowadays in the law-enforcement practice specialized computer polygraphs are used for implementation of IUP. They register dynamics of breathing, cardiovascular system and electric properties of skin, as well as speech and physical activity of a person.

As soon as IUP was introduced for application in procedural conditions (see sec. 3) a specialized polygraph appeared to be needed which would allow to fix the behavior of the examined person, but not only register his physiological reactions. The first computer polygraph in Russia – "PIK-01A" model, which makes a synchronized video-recording of the examined person and his physiological reactions, was created in 2004.

In the world-wide and domestic practice IUP is used to achieve the targets of two classes. First, it is used for investigations and official proceedings. In this case an examined person is subjected for testing to verify the information communicated by him earlier, when this information is crucial for inquiry and investigation of crime. Second, IUP is used during work with personnel in order to prevent infractions and crimes – so called screening tasks.

Reliability ("accuracy") of IUP results, according to the evaluation of domestic and foreign experts, is 83-95% which is rather high. For example, according to the reports of polygraphologists (IUP specialists) of US Federal authorities, summarized for many years, "the number of known in federally-administered polygraph examinations of criminal suspects is less than 1% of all polygraph examinations"3.

IUP is performed only on a voluntary basis. This is the basic principle of IUP. The background is not only the moral reasons and respecting human rights and freedom, but mainly the IUP process itself. According to the rules settled in the world-wide practice, a polygrapholog informs an examined person during a pre-testing interview that he (or she) may stop the IUP any time and refuse to further participation in this procedure.

If a person is not willing to be tested by polygraph, it is actually impossible to make him do it: he just would not allow the transducers to be placed and would not follow the instructions of polygrapholog and answer his questions.

In order to have a clear understanding of a real process of interrogation using a polygraph let us address to the IUP technique applied during investigations.

The entire structure of IUP – starting from the moment of the first contact with a polygrapholog regarding polygraph examination of somebody up to issuing the final documents stating the results of the IUP – consists of nine stages.

The first stage of IUP technology is the estimation of the investigated case (crime or incident) which came to be a reason to use a polygraph. Studying the investigated case a polygrapholog finds out the reasons why it is needed for the investigation to carry out an IUP, as well as to identify the availability of legal, procedural and organization factors which could make the use of polygraph difficult or eliminate the possibility of its use at all. These factors are: a person is not willing to be examined by polygraph; a person is physically or psychologically exhausted; a person has a disease of respiratory or cardiovascular systems at the aggravation stage; polygrapholog has lack of time which makes it impossible to perform a correct IUP, etc.

Being sure that there are no obstructions to use this method, a polygrapholog, together with a person authorized for the investigation determines a set of questions which are to be clarified by a

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polygraph, as well as proper conditions and time for IUP. The proper choice of questions for examination is very important since it determines the tactics for every next step of IUP.

Often during this stage it is found out that for the proper IUP it is required to obtain some additional information, to make some search and investigating actions and, thus, to postpone the IUP for a later period of time. Sometimes a polygrapholog may come to a conclusion that it is useless or inadmissible to use a polygraph, since IUP could affect the process of investigation.

So, this evaluation stage being formative in the IUP arrangement is completed by one of the three alternatives:

a) taking a decision that using a polygraph is efficient (immediate IUP);

b) taking a decision to arrange additional preparation for IUP (postponed IUP);

c) motivated refuse to perform IUP.

Taking one of the above decisions at the end of the first stage, a polygrapholog takes the entire responsibility for performance (or failure to perform) of the IUP, and thus he excludes any possibility for incorrect, ineffective or inadmissible use of polygraph.

If it is decided to carry out an IUP immediately or to postpone it, a polygrapholog gets down to its preparation.

The second stage of IUP is studying the record of the investigated case: a polygrapholog thoroughly studies all the data available and settles a number of subproblems.

First, a polygrapholog has to go into the question of the investigation, to understand the investigated case, to be able to keep in mind all the necessary details of the case which could be required him further during pre-testing interview and testing itself.

Second, studying the case a polygrapholog chooses the data of the following three categories:

a) true information about the person subjected to IUP or about the investigated case;

b) any facts or data which are not related to the case but which the examined person is going to conceal during the IUP due to any reasons;

c) different versions of the investigation about participation of the person subjected to IUP in the event investigated.

Studying the records a polygrapholog pays special attention to the so called particular characteristics of the investigated event which could be known only to the persons who have committed the crime or who are involved in it.

The data selected by a polygrapholog during studying the records serve him as an informational basis for the third stage of IUP – selection of methods and tests for polygraph testing and formulation of the questions for tests.

The world-wide practice have accumulated a huge experience of conducting polygraph interrogations and generated certain algorithms of their performance as per specific classes of cases investigated. In addition it should be underlined that this stage is certainly a creative part of preparation to polygraph testing and a polygrapholog should have good knowledge of theory and IUP technology as well as a certain art of human ingenuity.

During the next organizational stage a polygrapholog, together with an authorized investigator, settles the following technical issues: selects proper time and place (premises) for the polygraph interrogation; decides if it would be efficient to make audio- or video-recording of the IUP, etc.

During this very stage a polygrapholog should “calculate” a chapter of possibilities and choose a proper tactics for the pre-testing interview and following polygraph testing.
So, the final results of this stage are:

a) arranging the correct working conditions for testing;

b) a complex of tests and questions for polygraph testing;

c) a detailed knowledge of record by a polygrapholog.

As soon as the preparation is completed the fifth stage of IUP begins — pre-testing interview, which can last 20-30 min., but sometimes one or several hours, depending on a specific situation. During such interview a polygrapholog introduces a polygraph to the examined person and makes him familiar with the whole procedure, as well as notifies him that any attempt to lie, to conceal the information would be immediately identified by his physiological reactions registered by the polygraph. A pre-testing interview allows a polygrapholog to establish a necessary psychological contact with the examined person, evaluate his adequacy for the coming testing, and obtain the required information about his life, etc. During the preliminary interview a polygrapholog attentively listens to the interpretation of the investigated event offered by the examined person.

As soon as the pre-testing interview is completed, the main IUP stage comes — polygraph testing.

During polygraph testing, a polygrapholog discusses with the examined person before each test all the questions included into this test, and, if necessary, edits or adjusts them. A number of the tests to be used is determined only by a polygrapholog according his personal experience, the plot of the investigated event, testing conditions and so on and can consists of 4-5 up to several dozens tests, depending on the complication of the IUP targets.

The seventh stage of IUP is the analysis of polygrams, i.e. analysis of graphic pattern physiological reactions registered by the polygraph on a diagram paper or on the computer screen, and the interpretation of test results.

Carrying out the tests, step by step, a polygrapholog, on his own and with the help of a computer polygraph, analyses physiological reactions of the examined person to the questions asked to him.

Based on the evaluation of the reactions a polygrapholog makes his judgment about a personal significance of the questions asked for the examined person. Using the number of logical rules, a polygrapholog makes a conclusion regarding the reliability of the information communicated by the examined person earlier, or, in other words, regarding the presence (or absence) of the information concealed by this person.

As soon as testing is completed, the eighth IUP stage comes — after-testing interview, which depends on the results of the testing performed. If it was found out that the examined person have concealed something when asking the questions and it has been earlier agreed with the authorized investigator, it is recommended immediately to carry out an after-testing interview and try to incline this person to confession. A polygrapholog should not blame him to be a liar, but just underline that one or several questions of the test caused expressive reactions, and asks the examined person to provide his own explanations why it happened.

According to the domestic experience and the data provided by foreign specialists, it often happens that examined persons who have concealed the true information before IUP testify the confession after such a psychological influence.

The last ninth stage is a preparation of the concluding document, which includes the results obtained and provides the answers to the questions brought forward to IUP by the investigation.

The structure of the interrogaion using a polygraph carried out at clearance and investigation of the crime is provided in Fig. 1.

§3. Interrogation using a polygraph carried out at clearance and investigation of crimes

As soon as IUP was legalized in Russia in March, 1993 this method has been
progressively used in OSA to obtain orienting information.

Studying the experience of polygraph applications for the disclosure and investigation of crimes from the point of view of criminalistic practice allowed for the determination of **three groups of investigative situations**, when IUP comes to be the most effective:

1) there is no possibility to obtain the required information for investigation without a certain person involved;

2) it is possible to obtain the required information by traditional criminalistic or OSA methods, but it needs high expenses, a lot of time or human operational forces;

3) it is needed to get the information urgently (within one or two days or even just a couple of hours), but traditional means and methods can not provide for a quick arrangement. This target can be achieved only by IUP which determines the presence or absence of the required information in the human memory. Even if there is a lack of time, a professional polygrapholog can carry out IUP, strictly following all requirements of every stage described above.

During operational search activity and investigations IUP helps to evaluate the reliability of information communicated by an examined person. IUP is rather efficient when during operational search activity it needs to reduce the number of people aroused suspicion.

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**Figure. 1. Structure of interrogation using a polygraph at clearance and investigation a crime**
This is proved by the examples mentioned in the review of General Prosecutor’s office “Generalization of practice utilizing the possibilities of polygraph during investigating of crimes” (2005). Let us describe a couple of them.

The first one is the investigation of the criminal case regarding murder of Mrs. Z-va (Amurskiy region). “Before Mrs. Z-va disappeared, she lived together with Mr. B-ev who can be characterized as an aggressive and cruel man. B-ev testified that Z-va was gone away, and he was at his acquaintance’s place during the period of time interesting for the investigative process. As a result of examination by investigation the alibi of the suspected person was not confirmed, and the location of his brother (who had committed this crime – according to the changed evidence of B-ev) was not identified, and it was decided to... carry out an IUP. The results of IUP were beyond any expectations. These results indicated that B-ev could be involved in a number of similar crimes. As a result of diligent work of the investigators there were found undeniable arguments that B-ev had killed his own father who was wanted as a missing person, his cohabitant, as well as his acquaintances Bar-ov and G-k. On May 10, 2005 B-ev was convicted of all the incriminated crimes and sentenced by Amurskiy Regional Court to a long-term imprisonment”.

The second example comes from the practice of one prosecutor’s office in Chelyabinsk region, which handled the criminal case concerning the disappearing of Mr. U-ov. “It was found a person driving the car which, according to the evidence of Mrs. U-va, her husband left home in. The driver presented the documents proving that the car, which had been wanted immediately after the disappearance, was sold by Mrs. U-va. This fact, as well as protocols of relatives’ & neighbours’ examination provided a reliable background to make Mrs. U-va suspected in the murder of her husband. The IUP results complied with the investigation records. As soon as the suspected lady studied the conclusion of polygrapholog she confessed that she had committed the crime and mentioned the place where the corpse had been hidden”. These examples demonstrate that during crime investigations IUP provide the following possibilities:

a) to get actual data from the examined person or find out some circumstances of the investigated case which are significant for timely arrangement of operational search activity or which essentially expand the range of evidence;

b) to specify the actions of suspected persons or to eliminate the contradictions appeared during investigation;

c) to find out unknown information about crime committed by the suspected person;

d) make use of IUP results, demonstrate to the examined person that during testing it was found out that he conceals some important information and thus incline him to confession.

The certain efficiency of polygraph used in the operational search activity made the criminalists look for the ways of IUP application for investigation in procedural conditions.

In Russian procedural practice a polygraph was first used in 1994, in case of V.Syntsov who had been arrested for espionage and disclosure of state secret to a foreign state, as well as for practice grafts.

Investigation decided to use a polygraph at the stage when actual evidence on the criminal activity of the suspected person was partially accumulated, and it was required to find out some circumstances of unlawful activity of Syntsov. The results of IUP were provided as a conclusion of the specialist. The bill of indictment issued by The Head Military Prosecutor’s Office mentioned several times that “besides his own confession Syntsov is accused by the conclusion of specialists which used the results of polygraph interrogation”.

A significant experience of IUP application in procedural practice and use of its results as evidence has been gained during last ten years. There are different ways to attach IUP results to the case.

According one way, the case investigator (within the frames of separate instructions for operational search measures) requests agency of inquiry to carry out an IUP, and then he documents the results obtained in the files as abstracts from IUP reference or report. According other way, the conclusion of polygrapholog with IUP results is attached to the case, and after that the case investigator conducts an interrogation of polygrapholog (about IUP results and technology of analysis of the polygrams registered). The person who has been tested by IUP is interviewed as well, along with presenting of IUP results.

Case investigator may assign IUP results as "other documents" (sec. 6, part 2, article 74 of Code of Criminal Procedure of Russian Federation) and further use them as evidence which is then reflected in the bill of indictment.

In 2001 the specialists of the Institute of Criminalistics of the Center of Special Technologies of FSS of Russia for the first time carried out IUP in form of a forensic psychophysiological expertise. According to the statements of investigators of federal authorities in different regions of Russia, several dozens of forensic psychophysiological expertise have been carried out before the middle of 2006. A lot of results were recognized as evidence by different courts, including criminal military division and judicial division of The Supreme Court of RF. IUP in form of forensic psychophysiological expertise is the most promising procedure for the procedural practice.

4. Screening interrogation using a polygraph for prevention of crimes

It is well known that illegal actions or crimes committed sets a seal on an individual and form a certain custom of his behaviour which, in a large number of cases, directly shows what kind of behaviour at the same or similar conditions can be expected from this person in the future.

The background of screening IUP which appeared in the USA during 1930-s of the XX-th century was initiated by employers (governmental institution, commercial organization) aiming to employ people who would never cause any harm or damage to employers' business and would follow the prescribed discipline rules while performing their duties. Therefore initially the target of such IUP was to prevent official crimes and infringements of law committed by personnel at work, by "rejecting" those persons who concealed some deviations from requirements of the employer, i.e. hid the so called risk factors.

According to the data from American police polygraphologs, there are over 200 risk factors in the USA, which are studied when recruiting personnel to police. Every police authority selects those risk factors which are the most important for a certain region of the country and for the social group of people being selected to serve in police. According to the information from one of the Vermont state police authorities (USA), only 40% out of 184 candidates for police service were successful at screening IUP. American police polygraphologs made the conclusion that "a preemployment polygraph examination enables a police department to research an applicant's background more thoroughly in two hours than an experienced background investigator can do in three days. In addition, the majority of rejectionable offenses would not, in most circumstances, be uncovered during background investigation."  

Foreign experience has demonstrated that preventive IUP, depending on certain conditions and requirements of employer, should be used in the following three situations: a) employing for a job; b) during periodic (scheduled) personnel inspection; c) selective check of personnel (off-schedule). Screening IUP appeared in Russia only in the beginning of 1990-s and got wide application in a number of governmental (for example, in Ministry of Internal Affairs and FSS) and non-governmental institutions.

It was proved by domestic practice that a screening IUP can successfully diagnose concealed risk factors which are concealed by the examined person. These factors can be as follows: connection to criminal groups, commitment of some illegal actions in the past, involvement in drug-dealing activity, as well as hidden individual characteristics (alcohol-, drug-, gambling-inclination, etc.)

It has to be noticed that a polygraph can be efficiently used for prevention of crimes and infringements of law in economics where, according to the judicial statistics, 30% of criminal offence of commercial interests are committed by "insiders".

To illustrate the applied possibilities of IUP for fighting against the mentioned category of penal crimes let us briefly specify the possibilities of polygraph in the financial and banking field where the staff is the most important internal source of risk, according to the estimation of local and foreign researchers.

From the point of view of practice, the entire variety of criminal offence of infrastructure and property of the bank can be divided into two big classes: a) crimes committed by outsiders, i.e. persons who are not members of the staff, or without the help of the latter; b) crimes which can not be committed without involvement of bank personnel.

The second class (class "b") includes two groups of crimes:

a) crimes committed by bank personnel without involvement of outsiders. It can be, for instance, stealing of different kinds and illegal use of cash balance or equal funds, as well as illegal offence connected with misapplication of the official status, conditioned by commercial bribery, when a subject of the crime can be only a person performing a managing function, or realized in the computer security range;

b) crimes committed by outsiders with bank personnel involved. This group of crimes includes: stealing of money from current and settlement accounts of customers (when money is transferred to other accounts as per falsified payment instructions); appropriation of funds by stealing charge documents from the cash account; illegal possession of confidential information by stealing documents, etc.

According to the practice, it is inevitable that in a bank there always a more or less large "risk group" is formed, consisting of employees who are inclined to criminal offence - by their own initiative, forced by external circumstances or under pressure of structures unfriendly to the bank.

Application of screening IUP to the bank personnel - during pre-employment, periodic or selective check of personnel - is an efficient preventive measure restraining and reducing the occurrence of illegal offence. The Russian labor laws and federal law on commercial secret are the reliable basis for active application of IUP for prevention of crimes and infringement of law in the financial and banking field, as well as in those fields of economics where a commercial secret policy may be introduced.
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