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QUALITY MANAGEMENT SYSTEM IN FORENSIC LABORATORIES

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Abstract: Quality management system is important element of every working organization whether it deals with manufacturing material goods or giving services. Applying of quality system in forensic laboratory implies qualifying of the lab, commonality of the procedures in lab, defining of required working instruments, its calibration and verification, defining of qualified working profile for using those instruments, defining of the obligatory working procedures, etc. Application of quality system in processing of real evidence is one of the fundamental postulates for the validity of material evidence in court. This paper gives model of quality management system in forensic laboratories due to standard ISO/IEC 17025 as recognizing the competence of laboratories and accepting of testing and calibration results in all countries using this International Standard.

Key words: quality, quality management system, sample, forensic laboratory, validity of real evidence

1. Introduction

Quality management system is a sign post for all working procedures of one organization. The meaning of word “quality” is not just “good” or “the best”. It denotes the operative ability of organization for satisfying users requests of the services. It is evident that all of us are daily in contact with quality either as manufacturers (donors of services) or consumer (users of services). If we want a competitive organization at the market, there are the three most important business aspects which have to be compatible:

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1. the price of a product (service),
2. the quality of a product (service) and
3. the delivery terms of a product (service).

In the last decade, the theory and practice of quality management system have achieved tremendous changes in the world. These changes are in transition of relation with the demands of customers for quality. Nowadays, quality is the most important market factor and the basic element of being competitive. Perfection and excellence are standards of quality now. Satisfaction of consumers and other interested parties is ordinary and the accomplishment of new promises is aim which has to be realized. So, users of laboratory services require sharp and reliable laboratory results, the security of effective environmental management protection, health protection and the safety of employees, ergonomic, information and social systems in organization.

JUS ISO 9000 Standard gives the following definitions referring to quality system:

- Quality – the level which has to be achieved (demand or promise which are outspoken, implied and responsible);
- Quality management system – the management system which is used for leading of organization (from the quality aspect);
- Quality management – a part of quality management which is focused on satisfaction of quality demands;
- Quality assurance - a part of quality management which is focused on assurance of confidence that quality demands are achieved;
- Organization – an organized body; group of people, objects and equipment with retrieved responsibilities, authorization and relations;
- User – an organization or a person who gets a product;
- Deliverer – and organization or a person who delivers a product (goods);
- Process – a complex of activities which are in relevance and which simulate import elements in export elements;
- Product/service – the result of process.

2. Development of Quality Management System

The need for quality and measuring of quality changes over time are present in all phases of integral management of quality. High specialization in science field intrudes integration of science knowledge in the development of product (service), with the goal to obtain the level of recent demands. The development of quality management system (QMS) cannot be achieved only by

using sophisticated machines, modern technology, automation, etc. Experience, knowledge and qualification of employees are also needed. The development of quality management system is in relation with the development of its segments which are involved in the control, measurements, standardization, defining of technology in quality management system.

Scientific research in natural and other sciences cannot be imagined without measurements. The abilities of scientists for research, analyzing and applying nature phenomena depends on the available measuring instruments and measuring techniques.

3. Quality Systems and Validity of Real Evidence in Criminal Proceedings

The question of proving in criminal procedure is one of the most important and complex ones, but necessary for the correct and complete establishing of all legally relevant facts in order to attain truth. Proving is a set of activities directed towards correct and complete explanation of all legally relevant facts to reach the truth. This is the way how court reaches the decision in a concrete criminal matter. Actions which court undertakes in order to create belief about existence or nonexistence of facts that can have influence on its decision are called proving action or definition of the evidence in formal sense (Grubač, 2006). Definition of the evidence in material sense includes every proving foundation or reason that is contained in certain proving means which speak about the authenticity of some important facts for the proceeding (Grubač, 2006).

Nowadays evidence can be classified differently and this depends on the acceptance of the division criterion. For example, in foreign literature evidence is categorized into the two groups: the ways in which evidence can be proved and the main evidential rules. Evidence can be proved in the following ways: original (primary) evidence, real evidence, secondary and documentary evidence. For the purpose of this paper we will consider real evidence. Real evidence usually takes the form of a material object for inspection by the court. This evidence is to prove, either that the material object in question exists, or to enable the court to draw an inference from its own observation as to the object's value and physical condition (Johnston & Hutton, 2005).

Real evidence is known as scientific or forensic evidence which is accompanied by expert testimony, or expert witnesses (Brandl, 2004).

No matter what kind of evidence, each piece of evidence must fulfill certain standards in order to be admissible in court. This is particularly important for real evidence. There is clear and precise procedure that regulates how to handle real evidence, from the identification of clues at the crime scene to their pres-

entation in the criminal proceedings. To use physical evidence in a criminal or civil trial, the party offering the evidence has the burden of proving that the evidence is genuine and authentic. This requires testimony establishing an adequate foundation about where and how the object was obtained and that the object offered in evidence is the object that it is claimed to be. If the evidence could be subject to alteration by tampering, substitution, or contamination, a chain of custody must be shown (Zarkovic, Bjelovuk, & Kesic, 2008). This requires that all persons who had possession of the evidence must appear as witnesses to testify that the evidence had not been tampered with, substituted, or contaminated while the witness had custody and control of the evidence (Gardner&Anderson, 2004).

One way in which the law tries to ensure the integrity of evidence is by requiring proof of the chain of custody by the party who is seeking to introduce a particular piece of evidence. A proper chain of custody requires three types of testimony:

1. Testimony that a piece of evidence is what it purports to be;
2. Testimony of continuous possession by each individual who has had possession of the evidence from the time it is seized until the time it is presented in court, and
3. Testimony by each person who has had possession that the particular piece of evidence remained in substantially the same condition from the moment one person took possession until the moment that person released the evidence into the custody of another.

Proving chain of custody is necessary to “lay a foundation” for the evidence in question, by showing the absence of alteration, substitution, or change of condition. Whether the requisite foundation has been laid to establish chain of custody for an exhibit is a matter of discretion on the part of the trial judge. Possibilities of misidentification and adulteration must be eliminated, not absolutely, but as a matter of reasonable probability.

Besides that, handling forensic evidence is very important issue for the forensic laboratory accreditation process. Forensic laboratory must have accurate records of chain of custody. In order to meet the standard of quality control required for accreditation, the forensic laboratory immediately needs to document how evidence will be controlled in and out of the evidence/property room and to appoint Property Officer. Create and implement a policy to question, document and resolve where possible, any gaps in location of evidence before signing the next chain of custody entry. Duplicate logs should not be permitted.

The forensic laboratory should write procedures that require all evidence be locked in an examiner’s locked bench storage cabinet while not being handled

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during the testing process, or returned to the Property Room. All the examiners must sign the chain of custody record before further identifying the quality and quantity of drugs and controlled substances. It must be determined what type of evidence the laboratory will store temporarily and what it will store permanently. Clients must be informed about this policy and about special storage arrangements when evidence is returned to their jurisdiction. Generally, every laboratory must have a chain of custody record, with clear procedures and control to ensure the records are accurate. Everything we mentioned above is important to apply in practice to increase the reliability of real evidence in criminal courts.

4. Quality System Applications in Forensic Laboratories

The European Network of Forensic Science (ENFSI) was established in 1992. The main aim of the ENFSI is quality assurance of forensic labs, exchange of experiences and information in forensic field at science meetings, working group activities, special workshops, etc. The ENFSI has developed successfully from its beginning. The 56 laboratories come from 32 countries, geographically spread across Europe, including countries of the European Union as well as nearly all the EU candidates: Austria, Belgium, Bulgaria, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, the Netherlands, Norway, Poland, Portugal, Romania, Russia, Serbia, Slovenia, Slovakia, Spain, Sweden, Switzerland, Turkey, Ukraine and the United Kingdom. The importance of quality assurance is recognized in specialized forensic laboratories. So, the ENFSI has certain demands towards its members. Credibility and reliability of lab results are key items in trajectory of real evidence from crime scene to the court. Forensic laboratories, as the other laboratories who are dealing with similar examinations have to be accredited according to ISO/IEC 17025 standard.

The Quality and Competence Committee of the ENFSI is the one which is responsible for defining and application of quality management system. The Committee gives references for making the field handouts for forensic practitioner proceedings at the crime scene and in the lab, validity of applying laboratory methods, development of conscience that there is a need of the international quality system and the existence of international standards which have to be achieved and that the forensic labs have to be accredited. The Committee is also responsible for: the control of using the most sophisticated equipment and computer technology; use of the best sampling techniques at the scene; doing the field manuals related to the reliability of used measuring system; the

development of the strategy of communication and exchanging of experiences between the labs in Europe and in the world. The aim is to assure consequent and reliable real evidence at the court. The real evidence has to be based on science principles from the beginning: from the scene to the courtroom. That is why it is important to apply standards according to the lab working and accreditation of those labs. Nowadays, there is no reliable information how far the ENFSI members achieved control of lab personnel competence and accreditation of the labs. Some members of the ENFSI have already accredited their labs and some others have not done it yet, but they are on a good way to do so. The situation is different from one country to another. Each country has specific instruments. Some of them have sophisticated instruments, some of them not. For instance, some of them have SEM/EDX, some of them not. Some of them have sophisticated instruments for projectile speed measurement, some of them not. Each country has its own level of calibration of instruments. Each country has specific problems with spending recourses, references, etc. The accreditation of a forensic lab implies the presence of common instruments for specific researches and tests such as special microscopes, scales, equipment for chromatography, DNA and other analysis, competence of personnel (the appropriate value of a university degree, the attendance of special trainings and seminars, the presence of standard operating procedures and test methods, calibration and verification of methods, etc.). Calibration certificates for measuring instruments give the measurement deviation, or correction, and the uncertainty of measurement. Equipment has to be serviced from time to time. Quality can only be achieved by competent forensic practitioners that work under the guidance of a quality system and with the right philosophy of approach.

The key factor for a laboratory to be accredited is laboratory personnel. Accreditation of forensic labs requires not only competence of the personnel. Professional competence of each employee in a forensic lab and the concept of common standards for forensic practitioners should be defined also. The quality of modern apparatuses and the quality of personnel are not the only condition that should be provided. It is important that personnel should move its capacities and use its potentials to fulfill the established tasks. It is possible to be efficient in forensic practice if the employees are motivated for optimal use of their individual characteristics within a team. This accents the meaning of motivation and stimulation of personnel in quality management system development. The forensic laboratories have become production units rather than research units - with the performance of the organization becoming more important than individual efforts. This development has meant that the director's job has become a managerial job rather than a first scientist's job.

As the users of forensics there are judges, prosecutors and other subjects introduced in chain of forensics. They have the right to demand competence, specialty and responsibility from forensic experts. We now want to look at how we can define competence and how we can assess whether competence has been achieved. How do we recognize competence? Is it about how a person dresses or looks? Is it about adequate wearing of a working uniform? Is it about if a person is a member of an organization? Is it about qualifications or working experience? How do we recognize a competent person for special forensic field? We believe that it is almost impossible to define and recognize the competence in any objective manner in the absence of standards. That is why there is a need for defining standards for the forensic experts. Those standards are about proving the competence and professionalism of the forensic experts. It is about demonstrating competence in the workplace and not in the classroom during the education or special training, that is to say about actually doing the job. It is certainly not enough for an individual with a university degree today to be considered an expert in special forensic field.

Competence is a mixture of knowledge, skills and their application, attitudes and models of behaviors in special fields. It is important to know how to apply scientific knowledge for solving practical problems in forensics. Also, it is important to be good in representing the results and the form of written report, too. If one of the mentioned characteristics is missing we cannot consider forensic expert as competent.

Forensic expert must be cogent when presenting the results of expertise in the courtroom. Also, forensic expert must be good in answering the questions in the courtroom. It does not matter whether some mistake has been made at the crime scene during the sampling or during the transport to the forensic lab, or during the bad handling with sample in the lab, unless it is valid the real evidence would not be delivered to the court. That is why we have to define competence of forensic experts in crime scene investigation; the required field equipment with appropriate documentation about accuracy and validation; the standard operating procedures of handling evidence at the crime scene; the procedure of writing report from the scene (sampling, packing, transport and storage of collected evidences) to the lab; the required lab equipment with appropriate documentation about accuracy and validation; the required qualification and certification of the personnel; the procedures of handling lab equipment; the traceability of measuring and test equipment to the realization of CSI units; valid methods and appropriate form of results presentation.

4.1. *The Model of Quality Management System Appliance in Forensic Laboratories*

The National Criminalist Technical Center (hereinafter referred to as forensic laboratories) is in the process of introduction of quality management system (QMS). The development of the model of the QMS appliance in forensic laboratories is important for every laboratory which deals with similar tests. The aim of the QMS model is systematic approach in determination of the QMS situation and its design in forensic labs. The whole approach is based on: the insight of the present state, the analysis of the present state, the insight and analysis of standard demands and the defining of the present state improvement regarding to the standard demands. The basic approach of the QMS modeling is contemplated to:

1. Improve the present quality management system by modeling;
2. Design the model of the QMS and to introduce and certify it, and
3. The overall conditions of the QMS by model, to improve existent and accept new standards.

The technology of introducing and working of the QMS in forensic labs implies:

- The preparation for applying of laws and standards;
- The screening of transient situation of quality in management system;
- The design of the QMS;
- The introduction and certification of the QMS, and
- Checking if the QMS is certified.

For continuous and systematic management of quality in forensic labs as business systems, there is a need for defining of the QMS as the specialized subsystem of business system and for qualifying the other subsystems within a working net for the promotion of quality system. The algorithm at *Figure 1* shows design, introducing and certification of the QMS.

Preparation for applying of laws and standards means the decision about introducing the QMS; use of standards and laws to get information about the QMS; forming the working group (from their own experts or special consultants) and defining the working strategy – defining aims, terms and ways of implementation); the decision of nomination of chief assistant for quality; choosing of software backup for screening, design and introducing of the QMS; defining of the attitude that quality is important task for a lab as working organization which should be achieved through education and training; the qualification of management structure.

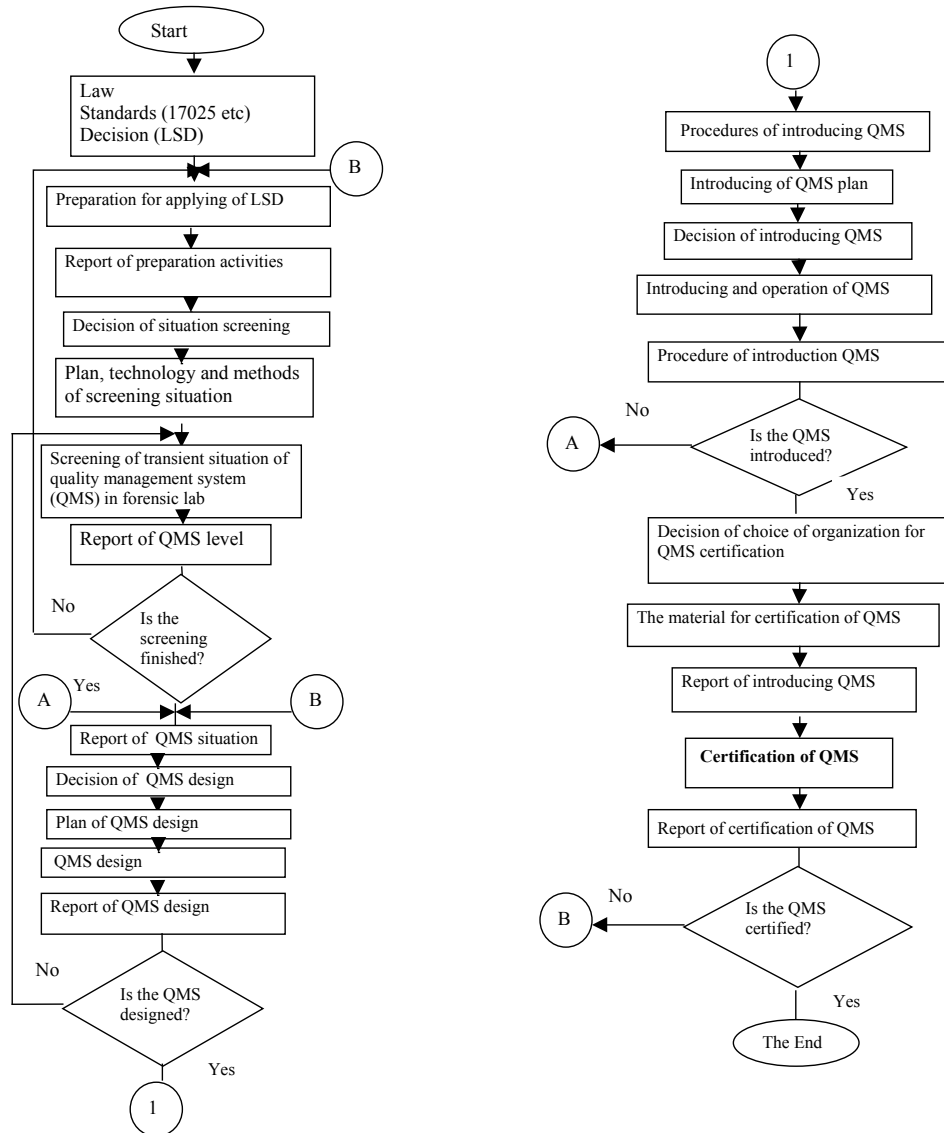


Figure 1. – Design procedure, introduction and certification of the QMS in forensic laboratories

Screening of transient situation of the quality management system (QMS) in forensic lab should diagnose the situation of the present QMS and its relation with standard demands.

Design of the QMS in forensic lab requires: planning of the QMS design and its subsystems, design and control of the QMS design, defining the aims

and policy of quality defining the QMS organization, making the global network procedure of high and low levels of hierarchy and making and control procedures of the QMS.

Introducing and operation of the QMS in forensic labs is the hardest part of the job and it is carried out through: considering, realization of planning and introducing of the QMS, observing complete technology of introducing the QMS, making decisions about solving problems in process of introducing and operating of the QMS, realization of quality politics, the QMS organization functioning and respect of global procedures in networking high and low levels of hierarchy, observing and analysis of introducing effects of the QMS and doing reports and observe terms of implementation tasks.

Certification of the QMS is verification of the achievement of compatibility between the introduced QMS and the standard. It implies: the choice of adequate institution which would certify the QMS; preparing the documentation for the certifying organization; introducing complete certification of the QMS; reading and analysis of report of certification results of the QMS and the assumption of correction if it is necessary; the meeting of promotion should be organized after getting certificate to inform business partners and doing interior and exterior certification of the QMS after a specified time. Each model of the QMS is adapted to new organization towards policy of introducing the QMS in lab, reports of transient situation, adequate standards and laws. The model of the QMS of forensic laboratory as a business system implies: the model to manage measurement, control and test equipment, the model for laboratory working and the model for data base. Document projects of the QMS are being accepted after probation. There is a need for the appropriate training of employees as we want to introduce the QMS after the creation of mentioned documents.

5. Conclusion

As the forensic crime scene practitioners look for “mistakes” of the delinquents in the form of real evidence so defense of the offender looks for “mistakes” of forensic experts and other subjects in the chain of custody at the court. The defense of the offender tries to arraign real evidence in court. The aim of introducing of quality management system in forensic labs implies minimization of risk of delusion in which forensics could bring with presentation lab results in court. That is why quality is the most important aspect of the forensics. Quality is achieved by the existence of qualitative forensic experts – practitioners who are doing their job with guidance of quality management system and accreditation of the labs also.

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SISTEM KVALITETA U FORENZIČKIM LABORATORIJAMA

Rezime

Sistem kvaliteta je veoma bitan segment u poslovanju svake radne organizacije bez obzira na vrstu delatnosti kojom se ona bavi (proizvodnja materijalnih dobara ili uslužna delatnost). Kada je reč o laboratoriji kao radnoj organizaciji, sistem kvaliteta podrazumeva njenu osposobljenost, unificiranje radnih postupaka počev od definisanja potrebne aparature za neki laboratorijski postupak, kalibracije instrumenata, definisanja sertifikovanog radnog profila, propisanih obaveznih radnih procedura isl. Sistem kvaliteta u obradi materijalnog dokaza (počev od samog mesta događaja do analize u forenzičkoj laboratoriji) je jedan od osnovnih preduslova za validnost materijalnog dokaza na sudu. Standard ISO/IEC 17025 se primenjuje pri akreditaciji svih laboratorija, pa i onih koje rade za potrebe pravosuđa – forenzičke laboratorije. U ovom radu predložen je univerzalni model primene sistema kvaliteta u forenzičkim laboratorijama sa pozitivnim efektima akreditacije laboratorija prema pomenutom standardu u smislu kompetentnosti i priznavanja rezultata rada laboratorije u svim zemljama sveta. Primenom ovog modela bio bi olakšan svaki naredni ciklus akredita-

cije forenzičke laboratorije, ali i znatno smanjen broj nepriznatih materijalnih dokaza od strane suda u postupku.

Summary

Quality management system is important element of every working organization whether it deals with manufacturing material goods or giving services. Applying of quality system in forensic laboratory implies qualifying of the lab, commonality of the procedures in lab, defining of required working instruments, its calibration and verification, defining of qualified working profile for using those instruments, defining of the obligatory working procedures, etc. Application of quality system in processing of real evidence is one of the fundamental postulates for the validity of material evidence in court. This paper gives model of quality management system in forensic laboratories due to standard ISO/IEC 17025 as recognizing the competence of laboratories and accepting of testing and calibration results in all countries using this International Standard.

FORENSIC EXPERIENCE IN EXHUMATION OF MASS GRAVES

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Abstract: Medico-legal expertise and identification of victims during the war and post war conflicts represent the most important humanitarian, scientific and ethical problem for the Republic of Serbia. The exhumation is a very important and usually the most important part of the process of which the successful identification depends on.

Forensic investigations in Kosovo and Metohija are currently going on. In this paper we observe all cases of kidnapped Serbs and other non-Albanians who were exhumed and identified during 2001, 2002, 2003 until the May 1, 2004, in several mass graves and in many individual graves. In the mentioned period of time, 280 dead bodies were exhumed and forensic team did autopsies, while 111 dead bodies were identified.

Our experiences proved that the process of exhumation is very important as a first phase of the identification process. Through the process of collecting the evidence of death, we made the „disappeared“ victims „visible“, empowered survivors, corrected the historical records and exposed cover-ups.

Key words: Kosovo and Metohija, exhumation, forensic investigation, mass graves.

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1. Introduction

Forensic investigations of mass graves or disasters are usually done by multidisciplinary teams (Chandrasiri, 1997). In the team there are: medico-legal experts, forensic archeologists, forensic anthropologists, odontologists, criminal-technical police officers, etc. The purpose of forensics in investigations of disasters or mass graves includes identification of the victims, cause of death and manner of death, collecting the evidence. These can help us find the cause of conflict and events which were lasting during the conflict (Hooft, 1988). Investigations of the victims from mass graves differ from the investigations of the victims in disasters because of the process of exhumation and the state of the corpses. The cause and the manner of death are deeply different.

Even after a long time, injuries on soft tissues sometimes can be easily seen which depends on the grade of putrefaction on buried corpse. It is very important to conclude that there are no injuries on the bones even if it is suspicious that some injuries exist. It is important to notice that if we have a lot of evidence on the site, under the existing conditions, discovery during the autopsy of exhumed dead bodies, with a less or more probabilities point to the cause of death, the origin of death, the mechanism of injuries, etc. Forensic expertise is very difficult when dead bodies are so putrefied that they demand special psychological and physical preparation of the scientists who do autopsies and the supporters whose task is to carry and prepare corpses for the expertise. (Williams, Crews, 2003.)

2. Research objective

The research objective is to present the complexity and importance of forensic investigations and the process of medico-forensic expertise as it relates to extremely complex and dramatic conflict and post-conflict conditions of exhumation of mass graves and individual sites on the territory of Kosovo and Metohija which impose a lot of different questions and tasks.

3. Research methods and materials

The process of performing exhumations, autopsies, and identifications in Kosovo and Metohija is currently ongoing.

In our research, we will present the work on the exhumation, autopsies and identifications of mostly Serbian and other non-Albanian victims, and a smaller number of Albanian ones, on the territory of Kosovo and Metohija, over the course of 2001, 2002, 2003, and the first half of 2004, up to May 1, 2004.

The obtained results are the product of the analysis of autopsy records generated by a mixed international expert forensic team, reports of anthropologists and odontologists, as well as the reports from the DNA analysis laboratory.

Exhumation sites are: Dragodan, Orthodox cemetery Prizren, Orthodox cemetery Priština, Muslim cemetery Đakovica (Brekovac), Istok, Košare, Kačanik, Suva Reka, Velika Hoča, Dragodan 2, Peć, Suva Reka (Dulje), Gnjilane, Orthodox cemetery Đakovica (Piskote), individual grave sites.

Exhumations were found by the testimony of witnesses, by accident, by military forces. The condition of the dead bodies was as follows: the bodies were in a bad state of putrefaction, there were skeletons, parts of bones. The origin of dead bodies was: one exhumation, re-exhumation, 2 or more exhumations, unknown. Both descriptive and analytical statistical methods were applied in this work. All of the stated parameters have been statistically processed and presented in the form of charts.

4. Interpretation and discussion of research result

The first and most important task of the investigation team is to locate graves. The best way to discover and locate mass graves is always by the eye witnesses. Local government had a good successes in discovering mass graves during the first few years after the war conflict because of the regret and willingness of witnesses to help local institutions locate the graves. It was published by the scientists from Finland who did a lot of great jobs in discovering and exhumation of mass graves in the area of Bosnia and Herzegovina, Croatia and Kosovo and Metohija. In the meantime, the time is passing, memories of witnesses pales, the quality of ground changes, so the role of anthropologists and archeologists becomes very important for the investigation teams.

Forensic archeologists investigate vegetations and the ground quality on the sites that the team presumes to be a grave site. The location of the site is discovered by the GPS system (Global Positioning System), and then mapped by geographical length and width. Forensic archeologists begin exhumation moving the surface of the ground by modern techniques and define the grave and position of the buried corpses. The next step is computer simulation of a grave.

In our investigations some locations were discovered by eye witnesses, but most of them were discovered by new military forces and by the recent research of the Hague tribunal (Photography No.1) (Documentation of Commission of Missing Persons of the Government of the Republic of Serbia).

Locations exhumed by the state of witnesses are: Priština, Dragodan Orthodox Cemetery, Priština, Gračanica, Podujevo-Šajkovac, Istok, Gnjilane, Uroševac, Kačanik, Đakovica, Suva Reka, Peć, Orahovac, Dečane, Prizren, Mali Trnovac, Zvečan.

Officially there are some locations the names of which are not made public, either there is no information or the corpses on those locations are not identified.

After establishing the location of a grave, the identification of the grave and corpse or corpses in it follows. That is the reason, why it is needed for the members of the Government and the members of mixed teams to be present at the site. It is the only way to explore all of circumstances which followed during the burial of the corpses. By our experience and experience of our colleagues from Croatia, the process of exhumation was also observed by the members of humanitarian organizations carefully and they verified collected data with the aim to present all events and circumstances to the public and all others interested parties.

Mass graves usually consist of many putrefied corpses. It is possible to find evidence of torture on them and extrajudicial executions (Photography No. 2).

The evidence on corpses request careful digging techniques using well known archeology in order to find the corpses for identification and to get the evidence of human rights being derogated. So, exhumations can last for weeks and months (Skinner, 1987).

In our research we present the exhumed locations on the territory of Kosovo and Metohija, over the course of 2001, 2002, 2003, and the first half of 2004, up to May 1, 2004.

If we look back at the years when we did exhumations, it is clear that number of performed exhumations varies from year to year (Chart 1). There is a high statistical significance of number of exhumations during 2002 and 2003, comparing to 2001 and 2004 ($p < 0,01$).

Exhumations were done on the territory under the observation of the United Nations. We can conclude that positive political agreements influence the process and the number of exhumations rises. The small number of exhumations during 2001, on the location with six and more corpses known as Dragodan (3.6%) is explained by late political talks and weather conditions because exhumations started at the end of 2001. Political cooperation during 2002 and 2003 led to coordination of activities and it is the result of many more exhumations, in 2002 there were 112 or 40 % of all exhumations, and in 2003 the number was 152 or 54.28%. The number of exhumations in 2004 was significantly smaller, until May 1, 2004, only 6 corpses (2.14%) were exhumed. The process of exhumation relatively stopped because of the same reasons. In the following years, which are not presented in this paper, until today, the number of exhumations did not rise by year to year.

Locations – graves exhumed with 6 or more corpses:
Dragodan (Priština)

Dragodan 2 (Priština)
Ortodox cemetery Prizren
Muslim cemetery Đakovica (Brekovac)
Istok
Suva Reka
Ortodox cemetery Đakovica (Piskote)

Locations – graves exhumed with less than 6 corpses:

Suva Reka (Dulje)
Velika Hoča
Kačanik
Košare
Gnjilane
Village of Koš
Peć

Individual grave sites are all over the territory of Kosovo and Metohija: the Ortodox Cemetery of Priština, Žegra, Glogovac, Velika Hoča etc.

If we compare the grave sites with six and more corpses to the grave sites with less than six corpses and the individual grave sites, there is no statistical significance, all of them are very important in our research. In our research there are significantly important numbers of grave sites with less than 6 corpses and individual, 55 cases 19.64% of all exhumed corpses (280), so it is required to change the methodological approach to mass graves in which every single grave we have to consider as “mass grave”. In all cases there were civilians, buried without any order or signs, at the crime site, within rather a close period of time.

The exhumed locations are scattered over the whole territory of Kosovo, with no particular order or rule. The fact that victims were found on the whole territory of Kosovo with a significant number of exhumed individual locations, most probably shows that the victims were killed randomly everywhere they were found, and if several people were kidnapped from the same settlement, they were also killed then.

The largest number of corpses were not buried after liquidation, but rather stayed in the open, until they were found by the KFOR or UNMIK (Photography No. 3).

In our research of the examined exhumed corpses, we conclude that the most corpses were in late-stage of decomposition, 92 corpses (32.85%), were mostly rotting; a skeleton, 66 dead bodies (23.57%) and skeletal remains, 122 cases (43.57%).

The time of death was several months earlier prior to finding corpses because of lack of soft tissues. On the other hand, the soft tissues on some bones had structure, so the time of death means about few years, probably at the period after kidnapping.

In our research, in this period of time, the presence of corpses in different phases of decomposition ($\chi^2 = 16,190$; $p < 0,01$) is statistically significant.

For the years of exhumation 2002 and 2003, there is a statistical significance of presence of decomposed corpses, skeletal corpses and parts of bodies ($\chi^2 = 35,635$; $p < 0,01$), (Chart 2). In our research the majority of the decomposed corpses were exhumed at the beginning of 2002, at the location Dragodan, the Muslim Cemetery Đakovica and the Orthodox Cemetery Prizren with high statistical significance ($\chi^2 = 120,914$; $p < 0,01$), but practically almost the same number of skeletal remains and parts of bodies. In 2003, the situation changes, so there were more body parts than the whole bodies. And the number of parts increases due to skeletal remains ($\chi^2 = 16,68$; $p < 0,01$). These results show some facts which lead to the large number of body parts.

The first thing is when a corpse is destroyed it is like destroying the evidence of crime and the identity of murderer. Many parts of corpses might be explained by the modern and very powerful weapons that totally destroy corpses after the fire.

It should also be known that during the exhumation and during the process of digging, packing and transportation of corpses, because of the late-stage of decomposition, some parts are lost by accident. It makes medico-legal expertise difficult during the explanation of the cause and origin of death if some small parts are gone.

Third, we cannot also forget the period of time, decomposition increases while time is passing and makes it difficult for the detailed medico-legal expertise through the work with corpses.

After bombing and the KFOR arrival, under the supervision of the International Criminal Tribunal for the former Yugoslavia (ICTY) on the territory of Kosovo and Metohija, in investigations of war crimes there were forensic teams from Austria, Belgium, Canada, Germany, France, Ireland, Spain, Sweden, Great Britain and the United States in summer and autumn of 1999. The experts of Danish-Swedish team in 1999 were working as mobile teams on some locations in Kosovo and Metohija. As they published their results, the main task was to exhume corpses just to explore the cause and origin of death. The identity was not important for their job, because a few corpses were identified before the autopsy (Sprogøe-Jakobsen at all., 2001.). The result of such investigations is that we saw about 600 exhumed but unidentified corpses during our expertise.

So, the forensics who work under the International justice have a task to do “categorical identification” as ethnical, religious belongings or race as well as the cause and origin of death. When the court realizes this, it hands over the process to national forensic experts to do personal identification. Very often, crises following wars withhold this process due to social and financial limitation until the end. In the meantime, the families of missing persons ask where their loved ones are.

When we compare all exhumations, these events resulted in re-exhumation in 97 cases (33.57%) and 2 or more times done exhumations (Chart 3).

There is a high statistical significance of differences in numbers of one exhumation, re-exhumation, 2 or more exhumation looking at the investigated years $\chi^2 = 63,379$; $p < 0,01$. During 2002 and 2003, statistically the majority of cases was one exhumation and re-exhumations and 2 and more compared to 2001 and 2004 were done. There is a high statistical significance of determined as opposed to undetermined exhumations $\chi^2 = 140,014$; $p < 0,01$. In our research one exhumation has a high statistical significance to re-exhumation $\chi^2 = 14,500$; $p < 0,01$

In the Guide for the Investigation of Mass Graves made by the United Nations there is a classification of mass graves to primary and secondary. A primary grave is the place where a dead person was buried and a secondary grave is the place where corpses were moved and reburied. These places are destroyed and undestroyed. A primary corpse is only exposed to the weather and ground conditions and in the secondary grave it is exposed to human activities. Secondary mass graves often mean testimony about malicious movements of human remains (to hide crime, etc.), which was found at many sites in Kosovo and Metohija.

5. Conclusion

Mass graves and individual grave sites in Kosovo and Metohija, were found mostly by military forces (the KFOR) and by the investigators during and after war conflict investigations to discover and document war crimes.

Over the course of 2001, 2002, 2003, and the first half of 2004, ending with May 1, 2004, 280 bodies were exhumed and autopsies were performed, 111 were identified, and 72 were given back to the families of the deceased.

Our research has so far been limited to the geographic areas of Kosovo and Metohija, and it is thought that the discovered number of exhumed bodies represents a smaller number of victims at the territory of Kosovo and Metohija. The processes of identification are ongoing, and they are performed continuously; it is probable that years will be necessary to complete the established tasks.

The exhumed locations are scattered over the whole territory of Kosovo, with no particular order or rule. The fact that victims were found at the whole territory of Kosovo with a significant number of exhumed individual locations, most probably shows that the victims were killed randomly everywhere that they were found, and if several people were kidnapped from the same settlement, they were then also killed together.

The success of medico-legal expertise is in direct correlation with the condition of corpses. Our research was on corpses which were in the state of decomposition 92 cases (32.85%), skeletal in 66 cases (23.57%) and body parts in 122 cases (43.57%).

The tasks were so difficult because of re-exhumations. Many forensic teams from Europe and the United States did exhumations after war conflict. In our research there were 94 corpses (33.57%) which had marks of autopsy having been performed earlier. Most of them were at the grave site known as the Muslim Cemetery in Djakovica and the Ortodox Cemetery Prizren, where we found 70 corpses instead of 56, while mixed body parts of several persons were found together in many individual body bags. Recent experience shows the importance of the process of exhumation for medico-legal expertise as the first and basic phase through collecting the evidence of death, empowered survivors, corrected the historical records and exposed cover-ups.

Our opinion based on our research changes the methodological approach to few individual grave sites, where the civilians were buried, without signs and marks, victims who lost their lives and were buried under the same circumstances within a short period of time, we can consider as a mass grave which is in most cases hiding traces of committed crimes.

Medico-legal documentation is a valuable collection of very impressive documents for professional, scientific and ethical investigations which will respect and protect basic human rights and human dignity.

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FORENZIČKO ISKUSTVO U ESHUMACIJI MASOVNIH GROBNICA

Rezime

Ekshumacija, obdukcija i identifikacija žrtava rata na području Kosova i Metohije predstavlja za državu Srbiju značajan humanitarni, socijalni i stručno medicinski problem. Pravilno izvedena ekshumacija predstavlja segment ovog procesa od kojeg u najvećem delu zavisi i uspeh identifikacije.

Proces ekshumacija, obdukcija i identifikacija na Kosovu i Metohiji je u toku. U uzorak su uključeni nestali i kidnapovani Srbi i ostali nealbanci koji su ekshumirani, obdukovani i identifikovani u toku 2001., 2002., 2003. i prvoj polovini 2004. zaključno sa 1.05 2004. godine na teritoriji Kosova i Metohije. Sa aspekta forenzičara-doktora sudske medicine koji je stručno nadzirao ceo proces prezentovano je pronalaženje grobnih mesta, iskopavanje, označavanje tela i svega pronađenog uz telo, transport do odgovarajuće referentne institucije. U ispitivanom periodu u nekoliko masovnih grobnica i većem broju pojedinačnih grobnih mesta 280 tela su ekshumirana i obdukovana, 111 je identifikovano.

Dosadašnja istraživanja ukazuju na važnost procesa ekshumacije prilikom koga se otkrivaju važne činjenice značajne ne samo za utvrđivanje identiteta žrtve već ukazuju i na okolnosti pod kojima je žrtva izgubila život a što predstavlja osnovu za kriminalističku obradu ovih slučajeva. Naša istraživanja ukazuju da bi veći broj grupisanih pojedinačnih grobnih mesta na kojima je zakopano lokalno stanovništvo bez određenog reda, nastradalo u sličnim okolnostima u kratkom vremenskom periodu, u metodologijskom pristupu trebalo smatrati masovnom grobnicom.

Summary

The identification of victims during war and post-war conflicts represents the most important humanitarian, scientific and ethical problem for the Republic of Serbia. The exhumation is very important and usually the most important part of the process which is important for the successful identification.

Forensic investigations in Kosovo and Metohija are going on. In this paper we observe all cases of kidnapped Serbs and other non-Albanians that were exhumed and identified during 2001, 2002, and 2003 until May 1, 2004 in several mass graves and in many individual graves. Within the mentioned period of time, 280 dead bodies were exhumed and forensic team performed autopsies, 111 dead bodies were identified.

Our experiences prove that the process of exhumation is very important as a first phase of process of identification, through collecting the evidence of death which made the „disappeared“ victim „visible“, empowered survivors, corrected the historical records and exposed cover-ups.

CONTRIBUTION TO ISSUES REGARDING LAW ENFORCEMENT IN A
LEGAL STATE IN THE FUNCTION OF CRIME SUPPRESSION

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Abstract: Issues related to the legal state have recently become topical again both among experts and in general public. The notion of the legal state can be approached from different aspects. However, it is necessary to point out that different terms ('legal state', 'the rule of law', 'constitutional state'), despite significant differences among them, still stem from the same essence and from the same question: what properties should a state as a legally arranged community have in order to ensure that all its members behave in keeping with the rules that provide their common will and in such a way as to ensure that the same rules apply equally to the same cases? In other words, law in a legal state should present a manifestation of common will, and not be imposed by a minority decision. This being achieved, another condition has to be fulfilled: such a law should apply to all community members without exceptions. The function of law enforcement in all spheres of social life and in the sphere of internal affairs in particular, is to prevent crime and contribute to crime combating.

Key Words: legal state, rule of law, legality, legitimacy, legal act, crime.

1.Introduction

This paper presents an attempt to point out the significance of creating an ambience of a legal state and the process of law enforcement in such an ambience, which contributes to combating crime. Since each of these issues, i.e. the issue of legal state, the issue of law enforcement, and the issue of combating

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crime, could be a subject of either a master or doctoral thesis, or a monograph, this paper will only outline these questions and try to establish harmony and relations among them.

Besides, although there are numerous differences between a legal state and a state founded on the rule of law, in terms of cultural, historical, social, political, legal and other differences, owing to a number of factors they are not so conspicuous nowadays. Still, a legal state is more focused on the state authority and the rule of law is equally focused on both the state authority and the rights and freedoms of the individual. This is the reason for a prevalent opinion among contemporary authors that there are no more such significant differences between the legal state and the state based on the rule of law.¹

The essence of the legal state is that all legal acts of state organs must be based on provisions contained in the state's most important legal act – the constitution. Such acts and provision contained therein must apply equally to all they concern. The security of everyone can be founded only on these foundations. This security is achieved by means of a system of legal rules which presents an order. In order to properly understand the functioning of a legal order, attention should be paid not only to creating a law, but also to its implementation, because a legal order “implies establishing, creating legal norms and their implementation².

Enforcement of laws relevant for internal affairs, as part of the legal system, implies the need to observe and respect scientifically established principles of a legal state. The time and circumstances which we live in call for further elaboration of these principles and even greater respect thereof in order to create an environment in which the mission of police in combating crime will be more efficient.

2. Legal state and law enforcement

The legal state, both as a phenomenon and a term first appeared in German political and legal theory during late 19th and early 20th centuries. German legal studies mostly relied on the formal understanding of the concept of legal state, placing a special emphasis on the need that state organs should obey the laws passed and that the work of state organs should be subject to judicial control, with a view to protect the rights and freedoms of citizens.

During the period of absolutistic feudal monarchy, judicial organs, and administrative ones in particular, performed their functions at their own discretion,

¹ D. Mitrović, *O pravnoj državi i drugim pravnim temama*, Belgrade, 1998, p. 215.

² R. Lukić, *Uvod u pravo*, Belgrade, 1964. p. 175.

relying on their own judgment and interpretation of state interests. It was a period characterized by legal insecurity of citizens. Passing on the legislative power to the parliament elected by a general vote, in keeping with principles of democratic bourgeois revolutions, among other things, meant the beginning of the legal state. The legal state thus originates from the process of restricting the absolute rule of the monarch, who used to be endowed with the totality of executive power, and this process began in the period of democratic revolutions. Bearing in mind that this process was somewhat late in Germany because its monarchy outlived the bourgeois revolutions in other European countries (England, France), it was the German legal literature that first used the concept and term legal state in late 19th century and early 20th century, although the idea was conceived earlier.³

The evolution of the idea of the legal state is marked by two stages which in a way present the universal tendencies of its development. These are the phases of a liberal “offensive” concept and the “defensive” conservative concept of the legal state.

The first stage in the development of the legal state appeared at the turn of the 18th and 19th centuries as a philosophical, legal and political demand for establishing a civil society, as opposed to the governing system of absolute monarchy. This implied the provision of all constitutive elements of the concept of ‘civil society’, such as the liberty of an individual in all spheres, free competition, abolition of old privileges of the noblemen⁴.

According to Huber, the establishment of the liberal ‘civil’ legal state resulted in laying the fundamental state and legal principle related to protecting the values of a new society: the man’s life, freedom, and property⁵. It was the outcome of social revolutions, such as the political one in France in 1789, and political reforms, such as the one in Germany in 1806.

New philosophy of the industrial era and departure from rationalistic and idealistic orientations towards positivism and naturalism in mid-19th century, emphasized by first social clashes between classes, resulted in the appearance of new theories about the state. A liberal concept of the state, advocated by Hobbes, Spinoza, Locke, Kant, Rousseau and Hegel, according to which it

³ For more detail on the topic of legal state and the state founded on the rule of law see: F. A. Hajek, *Politički ideal vladavine prava*, Zagreb 1994; K. Čavoški, *Pravo kao umeće slobode*, Beograd 1994; M. Lj. Petrović, *Pravna država*, *Ideje* br. 6, 1979; S. Popović, *O pravnoj državi neka razmišljanja*, Beograd, Draganić, 1995; E. Šarčević, *Pojam pravne države – ka razumevanju pravne države*, *Arhiv za pravne i društvene nauke* br. 4/1989.

⁴ Ernest Rudolf Huber, *Rechtstaat und Socialstaat in der modernen industriegesellschaft*, Oldenburg, p. 7.

⁵ Vlado Kambovski, *Pristup problemu uspostavljanja pravne države*, Belgrade, 1991, p. 15.

presented the negation of the society's 'natural state', determined by individuals' rights and freedoms, was explored anew in the light of newly accepted collectivistic idea of superiority of a nation and state and denying the 'natural state' of society.

Further development of the idea of the legal state brought about new phenomena, including interventions of the state in economy and other spheres of social life, as well as authoritarianism of the state authorities. The concept of a 'social state', attributed to Stein (in 1842) appears as a synthesis of all these tendencies. Increasing social and class-related conflicts are confronted by pacifist and solidarity-promoting understanding of state and law, accompanied by principles of arbitrariness and purpose. The social state attempts to promote general well-being as a goal and to overcome social and class conflicts through social integration, concisely outlined in the phrase that the state protects the society.

Weakening of the principle of legality, negation of human rights and democratic values, especially by extremism of totalitarian ideologies and fascist theories about the state and law in the 20th century encouraged a return to the idea of legal state as a means of saving contemporary society and its humanistic and democratic goals. The existing fear of totalitarian experiences induced by Hitler's or Stalin's ideologies was additionally intensified by a new fear, that the state may show a tendency to occupy all social activities and exert control by suppressing attempts at free individual creativity. It was this point in time that presented the turn of the tide and where the second, 'defensive' phase in the development of the legal state idea began.⁶

A synthesis of these contradictory tendencies is the theory of social legal state which combines the aspect of protecting the society from the state (the liberal aspect of the legal state concept) and that of protecting the society by means of the state (as an essential principle of the purpose of state and law). Combining these aspects has been a civilized way of overcoming class conflicts in the society, resolving them through reforms and in a civilized manner, transforming the class conflict into a social dialogue, and encouraging the opposed social classes within the state to abandon the positions of continuous conflict and engage in social partnership.⁷

Objections of both formal and essential nature can be raised against the legal state. They would not question only the justification of such a state, but also the very logics of its foundations. One of the formal objections arises from the

⁶V. Kambovski, *Pravna država, kriminalna politika i ljudske slobode i prava*, Informacije 1989/34, p. 5.

⁷ Huber, op.cit., p. 16.

man's imperfection and concerns the discrepancy between the proclaimed general law abidance and the law abidance of the sovereign. This issue was resolved by G. Jelinek and his theory of the sovereign's self-binding. According to him, the sovereign, by creating laws binds himself, and is therefore subject to the law.⁸ This explanation, however, does not seem convincing enough because the sovereign's self-binding is not truly legal binding. Otherwise, the sovereign would not be a sovereign any longer. Another important objection to the legal state concerns its contents. Namely, the legal state has no permanent contents. Various attempts at determining its permanent contents ended up in failure, since historical and legal experience includes in equal measures a liberal and fascist legal state, bureaucratic legal states and democracies, like contemporary developed countries.

These objections, related to either the formal issues or those of contents, indicate that the legal state is a contradictory concept and creation. The legal state, even when it is democratic one, today presents more of a "desired state of affairs" than a "reality which lasts or perhaps the ultimate purpose of social development".⁹

Since the legal state faces new, modern challenges that it cannot adequately deal with, we are led to conclusion that the legal state in the purity of its principles belongs rather to the realm of values than that of the real world. The above-mentioned challenge of positive law can be accompanied by at least another one, concerning the excess of norms, which, in the long run, turns a democratic state to an inefficient and bureaucratic one. Production of regulations in such a state may not be accidental and can be related to challenges concerning programmes and ideologies that in cases of social emergencies may lead to the 'rule of fear' which brings about 'tyranny.'

Facing these new challenges, the theory of legal state is once again perceived as problematic and relative. However, this does not imply that the concept should be abandoned, since the legal state has played a major role in remodeling collective awareness. It has contributed to popularity and legal definition of the society's topmost values, such as liberty, security and justice.

In fact, the legal state implies that it is ruled by law and not by force, and that everyone behaves in keeping with the law in terms of duty, so that everyone is equal before the law and the law equally applies to equal cases.

The implementation of law appears as an important part, and not only an indicator, of the functioning of law and the legal order. The issue of law enforcement as a prominent role of the state is very complex since it reflects the

⁸ G. Jelinek, *Upravno pravo*, vol. I, Belgrade, 1940. p. 79.

⁹ B. S. Marković, *Načela demokratije*, Belgrade, 1937, p. 10.

hierarchy of state organs and their acts. In order to insure the functioning of the legal order, all of its elements must be harmonized and organized according to strict rules into a unique system.

The legal order not only can but must be unique in order to perform its tasks. This is even more so because the complexity of legal order is additionally intensified by the existence of international law, which strongly influences legal orders of states. That is why the concept of law must always include both the law of the given state and international law. All these rules coexist and are binding for their subjects. Relationships between states and the international community determine the relations between their respective legal orders. This was facilitated by major changes concerning the subject and contents of international law provisions. They are no longer related only to questions of war and peace, but increasingly govern everyday issues (trade, transportation, human rights and freedoms, custom duties, crime combating, police cooperation, etc.) which used to be within the exclusive jurisdiction of states. This brings the question of implementation of international legal provisions within the legal order of each state on the agenda.

The implementation of international law within the internal legal order is not just fashionable; it reflects increasingly growing and more comprehensive participation in the life of international community, in its political and economic activities, as well as scientific, technological, social and cultural ones. This participation in the world trends call for harmonization and, where necessary, modification of outdated and inadequate legislation even to such an extent to influence in-depth changes of constitutional systems¹⁰.

The integration of society in the international community leads to an increasing number of instances of unified solutions to the problems of common interest on the level of international law, most frequently aimed at preserving and promoting general human values. These values by all means include combating crime (organized in particular) which knows no borders. That makes the role of international law in the national systems of justice more and more prominent. International law becomes the guarantee of legal security. The growing interdependence leads to the acceptance of only those legal solutions which enable international cooperation. Time changes and our need for legal security is reborn, but now we see it in the unity of international and national legal order, with all possible consequences. These consequences can be foreseen and truly accepted only by those who understand the legal state. Practically, problems arise not from differences of opinion, but from allegedly accepting the rule of law and linking it to purely political elements, such as democracy, free elec-

¹⁰M. Šahović, *Ustav i međunarodni odnosi*, Belgrade, 1990, p. 343.

tions, human rights and freedoms, etc. A state may have these features, but it will not be regarded as legal, i. e. based on the rule of law, unless its laws are observed and enforced.

Europe, which we strive to belong to, demands respect of law. It is presumed that laws should be passed in a democratic way and therefore there can be no excuses for possible failures to enforce them.

Principles of the constitutional order and lawfulness within a legal state impose the implementation of law. Certainly, this by no means implies that the law should be eternal and unchanged, but until conditions for its modification arise and until such the need for such a modification takes its legal course and proceedings, the effective law is to be observed. There should be no instances of laws which are effective, but not enforced in a legal state. The existing law that is not enforced ceases to be law and becomes its opposite. Besides, laws are passed to be enforced: *leges non verbis, sed rebus sunt impositae*.

There are various causes of non-enforcement and selective non-objective enforcement of laws. Most frequently, these concern flaws in the quality and quantity of law, but some also result from legal norms that are inappropriate in the given social setting. The said flaws in the quality and quantity of law which lead to non-enforcement or non-objective enforcement inevitably lead to hampering the principles of constitutionality and lawfulness which, in turn, leads to legal insecurity of all subjects that the law concerns.

Every legal system comprises two processes: the process of creation and the process of implementation. Both of these processes can hamper the principles of lawfulness and constitutionality.

Violation of these principles in the process of creating law should primarily lead to reactions on the part of judicial practice, especially the practice of constitutional courts, which are obliged to neutralize flaws of general acts.

Violations of the principles of constitutionality and lawfulness in the process of law implementation can be manifested in a number of ways – starting from insufficient qualifications of the subjects involved in the implementation and their license, to deeper, both subjective and objective causes, which stem from the very structure of the legal system and possible lack of systematic integration of judicial and social institutions. It is therefore vital, when defining the concept of the legal state, to delineate the area of social tolerance with respect to the principle of legality. When the limits of this area are violated, the legal state loses its legality. Hence it is of utmost importance to define criteria for recognizing such a state of affairs and they can be determined only by means of objective scientific methods, in a process of scientific study of relevant facts.

If we bear in mind that a crisis of a legal system is the opposite of the legal state, then all the elements of such a crisis are the opposites of the legal state's

properties, since the legal state exists when it ensures the rule of the legality principle within its legal system and in such a measure that its implementation falls between the bounds of social tolerance. Therefore a legal state and a crisis of the legal system cannot exist at the same time within one legal and state community. It should, however, be pointed out that neither of these social phenomena are “static” or “turned to stone” and that transformations from one property to another are not only possible, but also realistic and topical in the contemporary world.

When the crisis of the legal system is overcome by eliminating its causes and when the system starts to recover through creation of essential social prerequisites for better quality law enforcement, which will not be arbitrary and which will not lead endangering the constitutional order and lawfulness and legal insecurity, then it will not be difficult to find the way back to the legal state.

3. Enforcement of internal affairs laws in the function of combating crime

Speaking about law enforcement in the sphere of internal affairs, it should be emphasized that the internal affairs legislation presents an arranged system of legal norms that govern an important category of administrative activities performed by the Ministry of the Interior.¹¹ These are numerous and only a few of the most important ones will be mentioned:

Protection of life, personal security of citizens and their property;

Prevention and detection of criminal acts and tracking down and arresting perpetrators of criminal offences and ensuring their appearance before organs in charge;

Maintaining public order and peace;

Security of state border and control of border crossing and migrations and stay in border areas; and

Residence of foreigners, and other tasks envisaged by the Law on Ministries.

Almost all of the listed tasks were legally defined by relevant laws and accompanying bylaws based on them. It is of vital importance for the state that such a legally arranged system, which constitutes the law of internal affairs, is implemented in real life, because the enforcement of such law enables the state to ensure the safety of human lives, personal security and security of property, prevents and detects criminal offences and their perpetrators, maintains public

¹¹ D. Vasiljević, *Upravno pravo (poseban deo) oblast unutrašnjih poslova*, VŠUP, Belgrade, 2005, p. 40.

order and performs other security tasks. It should be pointed out that one of the main functions of organs that constitute the system of state administration, including police as its integral part, is to enforce laws and other regulations and general acts, i.e. to make sure they are implemented. To that effect, in order to perform this significant function, police have power to pass normative acts, administrative acts and administrative actions and measures in order to enforce internal affairs law.

Observing the principle of legality in the work of police actually means that they must pass the said acts and perform administrative actions and measures in keeping with respective legislation it is to enforce.

The normative acts that the police pass include regulations books, orders and instructions. These are all bylaws, which means that they cannot possibly be contrary to laws, so the police when passing them have to take care that these acts cannot impose obligations and rights for the citizens and other subjects that are not based on the law or vest the police with new powers that the statute does not provide for. Otherwise, there would be a violation of the legality principle and the need would arise for such acts to be removed from the legal system in a legal way.

Similarly, in the course of law enforcement the police issue administrative acts in the forms of decisions, permits and licenses, which govern administrative affairs related to specific rights, obligations and legal interests of physical persons and other subjects and in keeping with the law.

Police are empowered to take a range of administrative actions and measures in the enforcement of law in the internal affairs. The instances of this are numerous (establishing the identity, searching persons and premises, mandatory fines for certain offences, public registers, issuing of documents, detention).

It is important to stress that one of the main characteristics of administrative actions is that they are based on law. Here we can speak of their essential and formal lawfulness.¹²

The essential lawfulness of administrative actions has three main components. The first one is related to the fact that there must be legal prerequisites for their implementation. Namely, regulations strictly envisage the situations in which a certain administrative activity can or must be performed (e.g. the use of firearms). The second component is related to the very structure of the administrative measures. In other words, it determines when there are legal prerequisites for a specific administrative action and what activities exactly it comprises. The third one ensures that the application of a specific administrative measure must serve the specific legal purpose. Otherwise, misuse (or abuse) of power occurs with respect to the said administrative action (e.g. ill treatment of citizens, exerting illegal pressure, threatening or blackmailing, and the like).

¹²See, Z. Tomić, *Upravno pravo*, Draganić, Belgrade, 1995, p. 235.

Formal lawfulness of administrative actions has two components. The first one concerns clear and precise legal jurisdiction for performing every single administrative action. The other concerns the lawfulness of performing administrative activities and the course of their performance, including the means involved.

It should be pointed out that failure to observe any of the said components of their legality brings about legal irregularities in the administrative action. Unlawfulness of administrative actions often appears to be a consequence of unlawful legal acts upon which they are based. Because of this, the control of lawfulness of legal acts, especially those that have been performed, means at the same time the control of lawfulness of administrative actions performed on the basis of them. Similarly, the causes of unlawfulness of administrative actions should be detected in their complexity, but also in their being performed before passing the individual legal act. Certainly, a purely subjective moment must not be overlooked in this context, and that is improper qualification of the officers in charge and their susceptibility to temptation to abuse the power they are entrusted with.

The issue of law enforcement generally, as well as in the sphere of internal affairs, gains additional significance if we bear in mind that the quality of constitutional and legal rights and freedoms, the level to which they are observed and granted, will depend on this enforcement. This issue influences all three levels of police activities in the implementation of law in internal affairs: the passing of normative acts, the passing of administrative acts and the performance of administrative actions and measures.

It is therefore of utmost importance that the police should respect the principle of lawfulness when enforcing the internal affairs laws. The respect for this principle is an imperative for every democratic society which truly strives to ensure freedoms and rights of all citizens granted by the constitution. It is certainly justified to insist that human rights and freedoms of citizens should be strictly observed, but, on the other hand, a question arises whether this narrows the scope of police actions in combating crime. This again proves the fact that there are no ideal situations. Obviously, among the citizens whose freedoms and rights are guaranteed in the contemporary society without exceptions, and in accordance with the principle of equality, there are those who are inclined to commit crime and against whose illegal actions the police is supposed to protect other members of the society and certain social interests.

We can here conclude that the issue of degree to which the police observe human rights and freedoms, as well as a number of other important social issues, must be considered in their complex reality. Such an approach, in this specific case, would mean that the crucial issue of the use of police in a democratic

society would be the issue of balance between its exemplary legality and legitimate strictness in crime combating and maintenance of public order, on the one hand, and consistent observation of civil rights and freedoms, on the other. The balance means that this ratio is not always perfect and that it depends on a society's choice between two evils, that is, between the minimal interference of police with civil rights and freedoms and the danger that unrest and crime present for the entire society.

4. Conclusion

Through consistent enforcement of laws and bylaws that should contain legal norms harmonized with the achieved legal standards of the contemporary world, the police can be said to achieve the main goal of its activity, which includes suppressing crime, security of state and all its citizens, and upholding and protecting human rights and freedoms. This paper presents an attempt to emphasize the importance of creating an atmosphere and conditions of a legal state and true respect of the principle of lawfulness in both its formal and essential sense, in which the police will exercise their powers. Efforts within a society should be directed towards creating an environment of the legal state and the rule of law wherein the principle of lawfulness will be truly meaningful¹³.

In order to make the combat against crime (especially organized crime) more successful and to make the police powers more efficient in enforcing the laws related to internal affairs, it is necessary to continue further cooperation of our police with international police organizations, as well as to develop closer cooperation with foreign police agencies in as many fields as possible (scientific meetings, exchange of information, study visits, etc.).

Regardless of the obvious results achieved by the police in combating crime, increasingly deteriorating conditions in which they perform their tasks suggest that problems related to crime suppression cannot, in the long run, be dealt with adequately by enhancing human resources, technical equipment and similar steps. The efficiency of police work in this field will depend, primarily, and more than ever, on the creation of an environment of the legal state in which the police will perform their mission. This is the big challenge that lays ahead of us and it calls for huge efforts.

The role of police in the world of today is clear. They are expected to prevent crime, protect the security of state and its citizens. There are justifiable expectations that the police should detect and suppress every phenomenon which

¹³ For more detail see, M. Živković, *Vladavina prava i suzbijanje kriminaliteta*, *Pravni život*, no. 14/2007, p. 645-658.

jeopardizes these values. By protecting these values, they at the same time protect human rights and freedoms of all citizens. In order to achieve the defined goals, they are endowed with powers that they must exercise both efficiently and lawfully. Matters become even more complicated if new manifestations of crime are taken into account (organized crime, etc.). This demands that the society reconsiders the existing legal powers of police and other state organs with a view to their extension, so as to ensure that the struggle against crime is successful. But there should be measure in all this. It would be very wrong if the police thought that they were the only institution which should and can solve all social problems. They can certainly contribute to resolving these problems working together with other institutions. However, police work must take place within the bounds of existing laws, both national and international.

The legal state is only such a state in which all subjects, both citizens and state organs, respect the law always and on all occasions. If law is to be a guarantee of peace and security, then the state must guarantee the enforcement of law, both national and international, whose role is increasingly important in the more and more integrated international community. Law can be properly implemented only in the legal state. At least, this is a demand imposed on us by Europe, to which we believe we belong in all respects, including the legal one.

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PRILOG PITANJU PRIMENE PRAVA U PRAVNOJ DRŽAVI U FUNKCIJI SUZBIJANJA KRIMINALA

Rezime

Rad na temu "Prilog pitanju primene prava u pravnoj državi u funkciji suzbijanja kriminala" je uvek aktuelan. Bez obzira na činjenicu što se pitanju pravne države, pitanju primene prava i pitanju borbe protiv kriminala mogu posvetiti tekstovi ranga monografija, doktorskih i magistarskih teza, ovaj rad nema takvu pretenziju, već ima za cilj da čitaocu u načelnom smislu približi ova pitanja i dovede ih u međusobni sklad i vezu.

Suština pravna države ogleda se u potrebi da pravo u njoj predstavlja izraz zajedničkog htenja i da se kao takvo primenjuje na sve pripadnike bez ikakve razlike. Pošto oba ova zahteva nije moguće do kraja ostvariti u bukvalnom smislu, javlja se potreba da se odredi područje društvene tolerancije u okviru kojeg će biti moguća odstupanja, a da to ne ugrozi suštinu pravne države.

Za državu je izuzetno važno da se pravno uređen sistem, koji čini i pravo unutrašnjih poslova, primenjuje u realnom životu. Jer primenom ovog prava od strane policije, država obezbeđuje zaštitu života, lične i imovinske sigurnosti građana, sprečava i otkriva krivična dela i njihove izvršioce, održava javni red i mir i vrši druge poslove bezbednosti.

Efikasnost rada policije na planu borbe protiv svih oblika kriminala (posebno organizovanog) zavisice od stvaranja ambijenta pravne države u kojoj će policija vršiti svoju misiju.

Summary

The paper entitled *Contribution to Issues Regarding Law Enforcement in a Legal State Aimed at Crime Suppression* is always topical. Since the issues of the legal state, law enforcement, and those of combating crime can be subjects of more extensive considerations in the forms of monographs, doctoral or mas-

ter theses, the intention of this paper is to present these issues to the public and explain their interrelations.

The essence of the legal state is reflected in the need that its laws stem from common will and that they equally apply to all members of such a community. Since these two requirements cannot be fully met, there is the need to define the area of social tolerance within which departures will be possible without jeopardizing the essential principles of the legal state.

It is of vital importance for the state that the legally arranged system which constitutes law of internal affairs should be fully implemented in real life. Enforcement of this law on the part of police presents the means by which the state guarantees protection of lives, personal security and property, prevents and detects criminal acts and tracks down their perpetrators, maintains public order and performs other security tasks.

The efficiency of police work in the sphere of suppressing all manifestations of crime (especially organized crime) will depend on creating an environment of the legal state in which the police will perform their mission.

BRAINWAVES AND BRAIN FINGERPRINTING

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Abstract: The paper analyzes human brain as a source of low frequency electromagnetic waves within approximation of second quantization, to determine the energy and lifetime of brainwaves, as well as the internal brainwaves' energy. It has been concluded that the brainwaves' photons are of extreme low energy and they represent the hybrids of vacuum photons and spin waves, with strong damping depending on the direction of movement. On the other hand, the internal energy of brainwaves' photon system is rather high, but owing to short lifetime it does not result in brain cell destruction. Some applications of brainwaves are discussed as well: "brain fingerprints" in forensics, brainwaves' synchronization control of deeper states of consciousness and some unusual capabilities in a very short time period, brainwaves' control of video games...

Key words: Brain fingerprints, Linearized photon Hamiltonian, Brainwaves' internal energy

1. Introduction

It has been determined experimentally that human brain generates ultralow-frequency brainwaves, registered by electroencephalography (EEG) as changes of electrical potential of the brain that range in the interval from 1-125 Hz (Bassar, 1980, 1988, Nunez, 1981, Raković, 2008, Popović et al, 2009).

Brainwaves spectrum has five frequency areas (Raković, 2008): gamma, beta, alpha, theta and delta. The frequency of gamma rhythm ranges from (30-125) Hz, and is generated by the brain during evoked potentials, upon stimula-

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tion. The frequency of beta rhythm ranges from (13-30) Hz, and is generated by the brain in normal awake state, but also in REM sleep phase with intense dreams. The frequency of alpha rhythm ranges from (8-13) Hz, and appears spontaneously with eyes closed, and also just before falling asleep or after awakening, and have a key role in relaxation. Theta rhythm appears in frequency range from (3.5-8) Hz, and is spontaneously generated by the brain during non-REM sleep phase practically without dreams. Delta rhythm appears in frequency range from (0.5–3.5) Hz, and appears during deep non-REM sleep phase practically without dreams. Generally observed, in the awake beta state we are focused on the outside world, in the alpha state on our internal world, while theta and delta states penetrate deep inside. The lower the frequencies of brainwaves, the deeper we get into subconscious.

Based on the expression for energy of an oscillating quantum $E = h\nu$, where h is a Planck constant and ν is wave frequency, it can be concluded that brain photon energies range within the interval $(6,626 \cdot 10^{-34} - 3,13 \cdot 10^{-32})$ J. The stated energies are extremely low. Statistically observed, very high populations correspond to extremely low energies, so it can be expected the internal energy of the brainwaves system to be relatively high. Since we are talking about electromagnetic waves, based on the formula $\lambda = \frac{c}{\nu}$, where λ is electromagnetic wavelength, and c is the velocity of light, we come to the conclusion that brainwaves have extraordinarily long wavelengths ranging within the interval $(6 \cdot 10^6 - 3 \cdot 10^8)$ m.

The stated specific characteristics of brainwaves, which differ drastically from the characteristics of radio waves, the visible light waves and the characteristics of low-wave photons (quanta of x rays, quanta of γ -rays and quanta of cosmic radiation), impose the need to examine brainwaves in more detail. Such analyses are particularly interesting since there is a belief that psychic phenomena such as subject-object transpersonal interactions (Jahn, 1982, Raković, 2008, 2009) might be possibly attributed to brainwaves.

This paper will present an analysis of brainwaves in three sections.

The first section will present quantum-relativistic theory of photons. Single photon Hamiltonian will be analyzed in the approximate second quantization method, with the goal to determine the energies and life times of brainwaves.

The second part of the paper will analyze the internal energy of brainwaves' system and this energy will be compared to the corresponding internal energies of visible photon systems.

The third part of the paper will present some application of brainwaves: new method of brain fingerprints, brainwaves synchronization, and brainwaves and consciousness.

2. Brainwave's Photon Energy Spectrum

Brainwaves' photons will be analyzed using linearized photon Hamiltonian. It is known that a photon Hamiltonian:

$$\hat{H} = \pm c \sqrt{\hat{p}_x^2 + \hat{p}_y^2 + \hat{p}_z^2} \quad (2.1)$$

where c is the velocity of light and \hat{p}_x, \hat{p}_y and \hat{p}_z are momentum components, is not a linear operator and, as such, cannot be applied because of superposition principle. Representing the sum of squares inside the root sign in the form of square of the sum, Hamiltonian (2.1) is reduced to the linear form:

$$\hat{H} = c(\hat{\alpha}\hat{p}_x + \hat{\beta}\hat{p}_y + \hat{\chi}\hat{p}_z) \quad (2.2)$$

In the form (2.2), $\hat{\alpha}, \hat{\beta}, \hat{\chi}$ are 2×2 Pauli matrices (Messiah, 1970), which fulfill the following commutation relations:

$$\begin{aligned} [\hat{\alpha}, \hat{\beta}] &= 2i\hat{\chi} \\ [\hat{\chi}, \hat{\alpha}] &= 2i\hat{\beta} \\ [\hat{\beta}, \hat{\chi}] &= 2i\hat{\alpha} \end{aligned} \quad (2.3)$$

Based on the fact that the components of spin operator fulfill the commutation relations (Tyablikov, 1967):

$$\begin{aligned} [\hat{S}_x, \hat{S}_y] &= i\hbar\hat{S}_z \\ [\hat{S}_z, \hat{S}_x] &= i\hbar\hat{S}_y \\ [\hat{S}_y, \hat{S}_z] &= i\hbar\hat{S}_x \end{aligned} \quad (2.4)$$

comparing (2.4) to (2.3), we come to the following correspondence between spin operators and Pauli matrices:

$$\begin{aligned} \hat{\alpha} &= \frac{2}{\hbar}\hat{S}_x \\ \hat{\beta} &= \frac{2}{\hbar}\hat{S}_y \\ \hat{\chi} &= \frac{2}{\hbar}\hat{S}_z \end{aligned} \quad (2.5)$$

After substitution of (2.5) into (2.2), linearized photon Hamiltonian is obtained in the form of the product of components of photon momentum and corresponding spin components:

$$\hat{H} = \frac{2c}{\hbar}(\hat{p}_x\hat{S}_x + \hat{p}_y\hat{S}_y + \hat{p}_z\hat{S}_z) \quad (2.6)$$

Based on (2.6), it can be concluded that photon behavior is equally determined by its translation characteristics (momentum components) and its rotation characteristics expressed by spin operators.

Since Pauli matrices correspond to spin $S = \frac{1}{2}$, it is more convenient for further computation to express spin operator by means of Pauli operators P and P^+ . The relations between spin and Pauli operators are as follows (Tyablikov, 1967):

$$\begin{aligned}\hat{S}_x &= \hbar \frac{P + P^+}{2} \\ \hat{S}_y &= -i\hbar \frac{P - P^+}{2} \\ \frac{\hbar}{2} - \hat{S}_z &= \hbar P^+ P\end{aligned}\tag{2.7}$$

After substitution of (2.7) into (2.6), the Hamiltonian becomes:

$$\hat{H} = c\hbar\hat{p}_z + \hbar c \left[(\hat{p}_x - i\hat{p}_y)P + (\hat{p}_x + i\hat{p}_y)P^+ - 2P^+P\hat{p}_z \right]\tag{2.8}$$

Pauli operators fulfill the following commutation relations:

$$[P_n, P_m^+] = (1 - 2P_n^+ P_n) \delta_{nm}$$

$$[P_n, P_n] = [P_n^+, P_m^+] = 0, \quad n \neq m\tag{2.9}$$

$$P_n^2 = P_n^+ = 0, \quad (P_n^+, P_n)_{e.v.} = 0 \text{ or } 1$$

It can be seen that Pauli operators have kinematics which is a mixture of boson and fermions' kinematics. In practice, Pauli operators are replaced by Bose operators B and B^+ in the lowest approximation (Ashcroft, 1976).

Since momenta operators are real operator structures, linear per creation and annihilation operators of vacuum photons A^+ and A , we can write down:

$$\begin{aligned}\hat{p}_x &= \hbar k_x (A + A^+) \\ \hat{p}_y &= \hbar k_y (A + A^+) \\ \hat{p}_z &= \hbar k_z (A + A^+)\end{aligned}\tag{2.10}$$

After substitution of (2.10) into (2.8), a single photon Hamiltonian becomes:

$$\begin{aligned}
 H = & \hbar c k_z (A + A^+) + \\
 & + \hbar c (k_x - ik_y) A^+ P + \hbar c (k_x + ik_y) P^+ A + \hbar c (k_x - ik_y) AP + \\
 & + \hbar c (k_x + ik_y) A^+ P^+ + \hbar c P^+ P (A + A^+)
 \end{aligned} \quad (2.11)$$

It should be mentioned here that vacuum photons have two polarizations (Yuen, 1976), but the form (2.11) remains the same for both polarizations, so this is why we shall not denote particularly the kind of polarization.

During further analysis, we shall use the approximate second quantization method (ASQ method) of Bogoljubov (Bogolubov, 1979), and Tjablikov (Tyablikov, 1967), which consists in rejecting of third and higher forms in operator products and in replacing Pauli operators by Bose operators in the by-linear form. Based on this, further analysis of a single photon features will be carried out on the assumption that its Hamiltonian is of the following form:

$$H = Q(A + A^+) + MA^+B + M^*B^+A + MAB + M^*A^+B^+ \quad (2.12)$$

where:

$$\begin{aligned}
 Q &= \hbar c k_z \\
 M &= \hbar c (k_x - ik_y) \\
 M^* &= \hbar c (k_x + ik_y)
 \end{aligned} \quad (2.13)$$

Due to the presence of linear term in (2.12), this Hamiltonian might be unstable. Stabilization can be carried out by unitary and canonic transformation of A and B operators to the equivalent Hamiltonian without linear terms. It is easy

to show that transformations $A = a + i$ and $B = b - \frac{Q}{M + M^*}$ reduce (1.12) into:

$$H = Ma^+b^+ + M^*b^+a + Mab + M^*a^+b^+ \quad (2.14)$$

The presented transformations do not change either the form of the square Hamiltonian or the energy of the basic state. They change only population in the following manner:

$$\begin{aligned}
 \langle A^+ A \rangle &= \frac{1}{e^{\frac{E_A}{k_B T}} - 1} \rightarrow \frac{1}{e^{\frac{E_A}{k_B T}}} + 1 = \frac{1}{1 - e^{-\frac{E_A}{k_B T}}} \\
 \langle B^+ B \rangle &= \frac{1}{e^{\frac{E_B}{k_B T}} - 1} \rightarrow \frac{1}{e^{\frac{E_B}{k_B T}} - 1} + \frac{Q}{M + M^*} = \frac{\frac{Q}{M + M^*} + (1 - \frac{Q}{M + M^*})e^{-\frac{E_B}{k_B T}}}{1 - e^{-\frac{E_B}{k_B T}}}
 \end{aligned} \quad (2.15)$$

It can be seen immediately that quantum mechanical mean value of Hamiltonian (2.14) expressed per photon and spin conditions is equal to zero. This is why it is necessary to make its unitary transformation and that the further analysis is carried out with unitarily transformed Hamiltonian (2.14).

We shall here carry out double coherence unitary transformation (Bogolubov, 1979), i.e. we shall consider Hamiltonian

$$H_{eq} = e^{\varphi S} H e^{-\varphi S} \quad (2.16)$$

where φ is real parameter, while S is antihermitian operator given by:

$$S = ab - a^+ b^+ \quad (2.17)$$

By application of Weil identity (Tošić, 1978)

$$e^{\varphi S} H e^{-\varphi S} = H + \frac{\varphi}{1!} [S, H] + \frac{\varphi^2}{2!} [S, [S, H]] + \frac{\varphi^3}{3!} [S, [S, [S, H]]] + \dots \quad (2.18)$$

in (2.16), we obtain the equivalent Hamiltonian in the following form:

$$H_{eq} = H_0 + H_1 + H_2 \quad (2.19)$$

$$H_0 = (M^* - M)\varphi + (M^* + M)sh\varphi ch\varphi \quad (2.20)$$

$$H_1 = [(M^* + M)sh\varphi ch\varphi]a^+ a + [(M^* + M)sh\varphi ch\varphi]b^+ b + (M^* sh\varphi ch\varphi)aa + (Msh\varphi ch\varphi)a^+ a^+ + (Msh\varphi ch\varphi)bb + (M^* sh\varphi ch\varphi)b^+ b^+ \quad (2.21)$$

$$H_2 = M(1 + 2sh^2\varphi)a^+ b + M^*(1 + 2sh^2\varphi)b^+ a + [M + (M + M^*)sh^2\varphi]ab + [M + (M + M^*)sh^2\varphi]a^+ b^+ \quad (2.22)$$

Before we proceed with further analysis, we shall explain the role of real parameter φ which is arbitrary for the time being.

In the lowest approximation, Hamiltonian (2.19) can be written in the following form:

$$H_{eq}^{(d)} = [(M^* + M)sh\varphi ch\varphi]a^+ a + [(M^* + M)sh\varphi ch\varphi]b^+ b \quad (2.23)$$

and as such it represents a sum of vacuum photon Hamiltonian (term proportional to $a^+ a$) and spin excitations Hamiltonian (term proportional to $b^+ b$). Both excitations obey the same dispersion law:

$$E^{(d)} = [(M^* + M)sh\varphi ch\varphi]a^+ a \quad (2.24)$$

Due to the presence of $sh\varphi$ term, $E^{(d)}$ energies are proportionate to the degrees of φ parameter. It means that the energies are lower when φ parameter is lower. Since brainwaves' photons have very low energies, it is obvious that Hamiltonian (2.19), with φ parameter close to zero, should be used in the analysis of brainwaves' photon features.

Hamiltonian (2.17) does not conserve the number of excitations because of the terms of aa , $a^+ a^+$, bb and $b^+ b^+$ type (Agranovich, 1968). In addition to

this, due to the emergence of mixed $a b$ type terms, the excitations are neither clearly photon nor clearly spin ones, but the hybrids of two types of excitation.

Generally, Hamiltonian (2.19) can be diagonalized per operators of hybrid excitations by application of u - v Bogolubov transformations. In the observed case this procedure would be rather complicated and therefore we shall not use it. Besides, we are interested in brain photons energies only, and they can be determined by a considerably simpler procedure than u - v transformations.

The procedure is as follows: the equations of motion are written for a , a^+ , b and b^+ operators and they are made mean per coherent states:

$$|COH\rangle = e^{-(\mu^* a - \mu a^*) - (v^* b - v b^*)} a^+ b^+ |0\rangle \quad (2.25)$$

where μ and ν are complex numbers. This is how we come to the system of homogenous algebraic equations per unknown constants μ, μ^*, ν, ν^* :

$$\begin{aligned} (E - Rsh\varphi ch\varphi)\mu - (2Msh\varphi ch\varphi)\mu^* - [M(1 + 2sh^2\varphi)]\nu - [M^* + Rsh^2\varphi]\nu^* &= 0 \\ (2M^*sh\varphi ch\varphi)\mu + (E + Rsh\varphi ch\varphi)\mu^* + (M + Rsh^2\varphi)\nu + [M^*(1 + 2sh^2\varphi)]\nu^* &= 0 \\ -M^*(1 + 2sh^2\varphi)\mu - (M^* + Rsh^2\varphi)\mu^* + (E - Rsh\varphi ch\varphi)\nu - (2M^*sh\varphi ch\varphi)\nu^* &= 0 \\ (M + Rsh^2\varphi)\mu + [M^*(1 + 2sh^2\varphi)]\mu^* + (2M^*sh\varphi ch\varphi)\nu + (E + Rsh\varphi ch\varphi)\nu^* &= 0 \end{aligned} \quad (2.26)$$

where:

$$R = M + M^* \quad (2.27)$$

Secular equation of this system is as follows:

$$\begin{vmatrix} E - Rsh\varphi ch\varphi & -2Msh\varphi ch\varphi & -M(1 + 2sh^2\varphi) & -(M^* + Rsh^2\varphi) \\ 2M^*sh\varphi ch\varphi & E + Rsh\varphi ch\varphi & M + Rsh^2\varphi & M^*(1 + 2sh^2\varphi) \\ -M^*(1 + 2sh^2\varphi) & -(M^* + Rsh^2\varphi) & E - Rsh\varphi ch\varphi & -2M^*sh\varphi ch\varphi \\ M + Rsh^2\varphi & M(1 + 2sh^2\varphi) & 2Msh\varphi ch\varphi & E + Rsh\varphi ch\varphi \end{vmatrix} = 0 \quad (2.28)$$

and it is of the fourth degree per energy of excitation E and yields the laws of dispersion of hybrid excitations.

It can be shown that for $\varphi = 0$ secular equation is reduced to $E^4 = 0$. The same result $E^4 = 0$ is obtained in linear approximation $sh\varphi \approx \varphi$ and $sh^2\varphi \approx 0$ too.

If we use square approximation:

$$1 + 2sh^2\varphi = 1 + 2\varepsilon^2 + 0(\varepsilon^4)$$

$$sh\varphi ch\varphi = 1 + 0(\varepsilon^3)$$

the equation (2.28) takes the following form:

$$\begin{vmatrix} E - R\varepsilon & -2M\varepsilon & -M(1 + 2\varepsilon^2) & -(M^* + R\varepsilon^2) \\ 2M^*\varepsilon & E + R\varepsilon & M + R\varepsilon^2 & M^*(1 + 2\varepsilon^2) \\ -M^*(1 + 2\varepsilon^2) & -(M^* + R\varepsilon^2) & E - R\varepsilon & -2M^*\varepsilon \\ M + R\varepsilon^2 & M(1 + 2\varepsilon^2) & 2M\varepsilon & E + R\varepsilon \end{vmatrix} = 0 \quad (2.29)$$

and is reduced to bi-square equation per E energy, which takes the following form:

$$E^4 - 4\varphi^2 DM^* E^2 + 2\varphi^2 D^3 M^* = 0 \quad (2.30)$$

where

$$D = M^* - M \quad (2.31)$$

The solutions of the equation (2.30) are given by:

$$(E^2)_{1,2} = 2\varphi^2 DM^* \pm \sqrt{4\varphi^2 D^2 M^{*2} - 2\varphi^2 D^3 M^*} \quad (2.32)$$

Since in (2.32) D and M values are complex, the solutions would be quite bulky so we decided in favour of approximation of the equation (2.32), i.e. we have assumed that:

$$(E^2)_{1,2} = \varphi D \sqrt{-2DM^*} \quad (2.33)$$

In the formula (2.33) the components of wave vector k_x , k_y and k_z have been expressed in spherical coordinates:

$$\begin{aligned} k_x &= k \sin \theta \cos \phi \\ k_y &= k \sin \theta \sin \phi \\ k_z &= k \cos \theta \end{aligned} \quad (2.34)$$

where $\theta \in [0, \pi]$ is azimuth angle, and $\phi \in [0, 2\pi]$ is polar angle and $k = |\vec{k}|$.

After these substitutions, the equation (2.33) is reduced to:

$$(E^2)_{1,2} = 4i\varphi(\hbar ck \sin \theta)^2 e^{i\frac{\phi}{2}} \sin \phi \sqrt{-i \sin \phi} \quad (2.35)$$

We conclude from the last equation that the energies of brainwaves' photons depend on the direction of their motion, which is determined by angles θ and ϕ .

It is appropriate for further analysis to examine the solutions of (2.35) in the upper plane xOy and in the lower plane respectively.

In upper plane $\sin \phi$ is constantly positive, so for solutions we can write down

$$(E^2)_{1,2} = \mp (\mathfrak{R}_\circ + iJ_\circ) \quad (2.36)$$

where:

$$\mathfrak{R}_\circ = 2\sqrt{2}\varphi W^2(\theta) \left(\cos \frac{\phi}{2} - \sin \frac{\phi}{2} \right) |\sin \phi|^{\frac{3}{2}} \quad (2.37)$$

$$J_{\cap} = 2\sqrt{2}\varphi W^2(\theta)\left(\cos\frac{\phi}{2} + \sin\frac{\phi}{2}\right)|\sin\phi|^{\frac{3}{2}} \quad (2.38)$$

and

$$W(\theta) = \hbar ck \sin\theta \quad (2.39)$$

In lower plane $\sin\phi$ is constantly negative, so the solution may be written down as:

$$\left(E_{\cup}\right)_{1,2} = \pm(\Re_{\cup} - iJ_{\cup}) \quad (2.40)$$

where:

$$\Re_{\cup} = -2\sqrt{2}\varphi W^2(\theta)\left(\cos\frac{\phi}{2} + \sin\frac{\phi}{2}\right)|\sin\phi|^{\frac{3}{2}} \quad (2.41)$$

$$J_{\cup} = 2i\sqrt{2}\varphi W^2(\theta)\left(\cos\frac{\phi}{2} - \sin\frac{\phi}{2}\right)|\sin\phi|^{\frac{3}{2}} \quad (2.42)$$

To determine the energy of hybrid excitations, the known formula for square root of a complex number is used:

$$\sqrt{X + iY} = r + ij \quad (2.43)$$

where:

$$r = \pm\sqrt{\frac{\sqrt{X^2 + Y^2} + X}{2}} \quad i \quad j = \pm\sqrt{\frac{\sqrt{X^2 + Y^2} - X}{2}} \quad (2.44)$$

Combining (2.43) and (2.44) with (2.36) and (2.40), we find the energies of hybrid excitations.

For the photons in the upper plane $X = \Re_{\cup}$ and $Y = J_{\cap}$, while for the photons in the lower plane it has been taken that $X = \Re_{\cup}$ and $Y = J_{\cup}$.

The terms with $r > 0$ and $j < 0$ (Abricosov et al, 1965), have physical sense, whereas it must be that $|r| \gg |j|$. Excitation life time is determined according to the following formula:

$$\tau = \frac{\hbar}{|j|} \quad (2.45)$$

Analytic expressions for energies are rather bulky (see formulae (2.37), (2.38), (2.41) and (2.42)), and therefore we shall not quote them. It is much more convenient to quote numerical values, which as it can be seen depend on the direction of propagation.

Yellow line with the energy of $E_y = 3,313 \cdot 10^{-19}$ J has been taken as a match mark to determine the value of energies. Small parameter φ has been

determined as a correlation of the lowest brainwaves' photon energy amounting to $6,626 \cdot 10^{-34}$ J and the aforementioned energy of the yellow line. This is how we have come to the value of small parameter φ , which amounts to $2 \cdot 10^{-15}$.

Based on the found value of parameter φ , using the energy of the yellow line we have obtained, for instance, that photons corresponding to the angles:

$$\phi \in \{1^\circ, 30^\circ, 45^\circ, 60^\circ, 90^\circ, 120^\circ, 150^\circ, 179^\circ\},$$

have the respective lifetimes:

$$\tau \in \{191ns, 12ns, 8ns, 6ns, 4ns, 6ns, 12ns, 191ns\}.$$

The photons moving in the direction $\theta = \phi = 1^\circ$ have the longest lifetime $\tau = 10944$ ns. Real parts of energy range between $(2 - 10)10^{-26}$ J.

3. Internal Energy of Brainwave's Photon System

We have seen in the first section that the energy of brainwaves' photons whose frequency is $\nu = 1$ Hz amounts to $E_1 = 6,626 \cdot 10^{-34}$ J. Statistic probability that the excitation with this energy is registered at the temperature of human body, which is $T = 310$ K, is given by:

$$n = \left(e^{\frac{E}{k_B T}} - 1 \right)^{-1} \approx \frac{k_B T}{E} \quad (3.1)$$

and amounts to $n = 6,456 \cdot 10^{12}$. On the basis of this the internal energy, which accounts for a single brainwave's photon, amounts to $k_B T = 4,278 \cdot 10^{-21}$ J. The obtained result represents Dulong-Petit law (Ziman, 1996, Mizutani, 2003), for internal energy per a single phonon in the Debye theory of specific heat in a solid. The important difference is that Dulong-Petit law is valid for temperatures from 500 K and higher, while for brain photons it is valid for temperatures up to 10^{-1} K.

The conclusion is that the internal energy for brainwaves' photons is computed according to Dulong-Petit law for all temperatures higher than 0.1 K (practically along the entire scale of absolute temperature).

Considering the obtained result for statistic probability ($n = k_B T = 4,278 \cdot 10^{-21}$) J, the internal energy of brainwaves' photons, corresponding to 1 gmol of brain cells, amounts to $U = 2576$ J.

In the theory of the second section, we have obtained the hybrid brain excitations whose energies and lifetimes depend on the direction of spreading. We

shall here estimate the internal energy of 1 gmol hybrids which spread in the direction $\theta = \phi = 1^\circ$.

Since the lifetime of these photons is relatively long, 1 gmol energy was computed according to the following formula:

$$E_h = 6,023 \cdot 10^{23} \frac{\text{Re } E}{e^{\frac{k_B T}{\text{Re } E}} - 1} = 6,023 \cdot 10^{23} \frac{2,253 \cdot 10^{-29}}{e^{\frac{2,253 \cdot 10^{-29}}{1,38 \cdot 10^{-23} \cdot 310}} - 1} = 2714 \text{ J/mol} \quad (3.2)$$

It can be seen that the internal energy of hybrid photons, produced by 1 gmol of brain cells is somewhat higher than the energy of 1 gmol brainwaves' photons of the lowest energy.

For more obvious comparison, we shall determine the internal energy of 1 gmol photons of the yellow line at the temperature of human body, $T = 310 \text{ K}$:

$$E_y = 6,023 \cdot 10^{23} \frac{\text{Re } E}{e^{\frac{k_B T}{\text{Re } E}} - 1} = 6,023 \cdot 10^{23} \frac{3,313 \cdot 10^{-19}}{e^{\frac{3,313 \cdot 10^{-19}}{1,38 \cdot 10^{-23} \cdot 310}} - 1} = 4,64 \cdot 10^{-29} \text{ J/mol} \quad (3.3)$$

Comparing (3.2) to (3.3), we can conclude that the brainwaves' photon system has much higher internal energy than the corresponding system of visible photons. This conclusion is compatible with the fact that metal objects may be bended and moved by psychic intention (Jahn, 1982), possibly by means of brainwaves' photons.

4. Some Applications of Brainwaves

4.1. Brain fingerprints

Traditional polygraphs which have been in use for many years yield unreliable results of respondent's emotional response to the questions asked. This method has been improved by the introduction of new technologies with direct access to the respondent's brain. In this way the "brain fingerprints" are created. These are actually the brainwaves detected after the scenes of suspect's crime have been shown and prior the respondent is able to influence the flow of his thoughts. While the traditional lie detectors lean on fluctuations of breathing, perspiration and blood pressure, "brain fingerprints" are based on a set of brainwaves which are registered as short electric patterns when a person recognizes some already known stimuli. The computer records and measures the brain response to these stimuli, giving the results which suggest whether or not the suspect's memory contains the information on the crime only the perpetrator could know. The system can also suggest if the suspect is a terrorist, showing that he recognizes the secret details of the enemy training camp.

Brain Fingerprinting testing represents a new paradigm in law enforcement. It is a technology that has been researched and tested for more than 20 years and is now admissible in court as scientific evidence. The testing system is based on EEG/P300 which determines with extreme accuracy whether or not a certain piece of information is stored in a person's memory. The test measures the response of a person's brainwaves to certain words, images or sounds which are presented to him/her on the computer. The measurements are recorded in parts of seconds after the stimulus is presented, before the subject can formulate or control his/her reaction. The results of this patented testing methodology have been ruled admissible in court as scientific evidence.

Brain Fingerprinting testing will determine if specific information is in the brain, but will not tell us how it got there. DNA evidence and fingerprints are available in only about 1% of major crimes. It is estimated that Brain Fingerprinting testing will apply in approximately 60 to 70% of these major crimes. The inventor of this method is Dr. Larry Farwell (Farwell, 1995, Farwell, 2001). Brain testing method ("brain fingerprinting") is similar to finger print lifting method. It is formed by means of "P300" brainwaves (evoked potentials). Based on this it is determined whether there was a piece of information (image) connected with the question asked in the respondent's brain. The fundamental difference between the perpetrator of a crime and an innocent person is that the perpetrator, having committed the crime, has the details of the crime stored in his memory, and the innocent suspect does not.

This is what Brain-fingerprinting testing detects scientifically, the presence or absence of specific information. During a Brain-fingerprinting test, relevant words, images or sounds are presented to a subject by a computer in a series with irrelevant and controlled stimuli. The brainwave responses to these stimuli are measured using a patented headband equipped with EEG sensors. The data are then analyzed in order to determine whether the relevant information is present in the subject's memory. The brain of a subject who has the relevant information stored in his brain emits a specific, measurable brain response known as a P300. The P300 response has been extensively researched for more than 30 years. This research has been widely published by leading professional journals and the P300 response has gained broad acceptance in the scientific field of psychophysiology. In his research on the P300 response, Dr. Farwell discovered that the P300 was one aspect of a larger brainwave response that he named and patented, a MERMER. The discovery of the MERMER allows the results gained through P300 testing to be substantially more accurate. The quality of this device and the advantage in comparison with traditional lie detectors is in the fact that the data contained in a person's memory are revealed by a computer. The respondent is connected to a computer using a corresponding device

which is placed on his head. Therefore, all the conclusions about the data stored are made by a computer, without any subjective influence of a person conducting the testing, Figure 1 and Figure 2.



Figure 1 – Dr Farwell’s brain testing method

The application of this method in judicial practice has already been legitimized in some parts of the USA. First of all there has been a testing carried out, in which even the FBI took an active part. A large number of people were tested from various surroundings, among which were also those employed by the FBI. The results showed a remarkable precision – 100% accuracy of this method, which is a huge progress in comparison to controversial results of lie detectors that have been in use so far. The method was first used in Oklahoma. The first to be tested was Jimmy Ray Slaughter, who was sentenced to death for double murder, of his girlfriend and their child. The results of testing by “brain fingerprinting” showed that the images of the place where the body of a murdered woman and the clothes she wore were not stored in his memory.

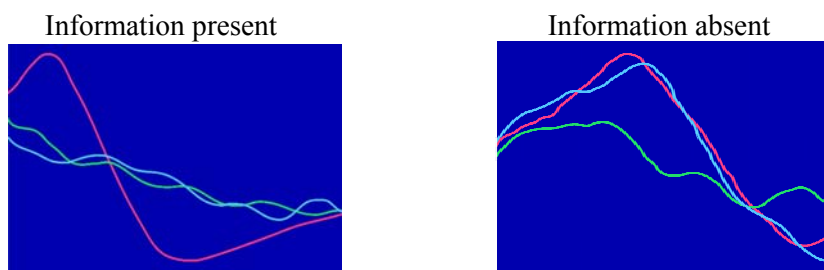


Figure 2 – Test results

The evidence such as fingerprints or DNA is rare while the offender’s brain is always present – it plans, executes and stores the crime. There are memories of the crime stored in the perpetrator’s brain and in the brains of those who were

his accomplices. Technology can detect these recordings in the brain and help identify trained terrorists before they attack, including the so-called “sleepers”. This technology will also be used to improve security in areas such as obtaining visas and protecting secret information, national security, medical diagnostics, advertising and criminal justice.

So far the research has shown that P300 brainwaves are very efficient in early identification of Alzheimer’s disease. MERMER technology, developed and patented by Brain Fingerprinting Laboratories, includes the P300 brainwave and extends it, providing a more sensitive measure.

Diagnostic and monitoring systems for Alzheimer’s using this new technology are being developed. A patient with Alzheimer’s diagnosis will be subjected to a series of testing within a certain period of time in order to measure his progress and response to certain therapies. The tests are simple and non-invasive and can be carried out in any clinic or at a local physician. The systems which are being developed will enable early identification of Alzheimer’s disease and monitor the changes in cognitive functions within a short period of time. Pharmaceutical companies are also interested in this technology since it can enable them to determine with a greater accuracy whether their medications for Alzheimer’s disease are effective. This could enable the reduction of research costs and probably speed up the process of launching a new product to the market.

The majority of advertising campaigns is evaluated subjectively using a focal group. Brain Fingerprinting laboratories offer scientific methods which help determine which information a person has stored. For instance, during a branding campaign, whether the people memorize the brand, the product, and so on and how the results vary demographically. The parallel efficiency of several types of media can also be measured.

In the insurance industry, the frequency of insurance frauds could be reduced by determining whether a person has any knowledge about the fraud. The same kind of testing can help determine whether a person has a certain knowledge related to computer crimes, where there are usually not any witnesses or physical evidence.

4.2. Brainwaves synchronization

Brainwaves synchronization can provide a shortcut for reaching deeper state of consciousness and unusual capabilities within a short period of time. This is achieved by means of earphones. Synchronization is carried out in such a way that the brain frequency starts to approach the frequency of the outside source, Figure 3 (Pfurtscheller, 1999). The outside rhythm (frequency) has a direct effect upon psychology and physiology of a person.

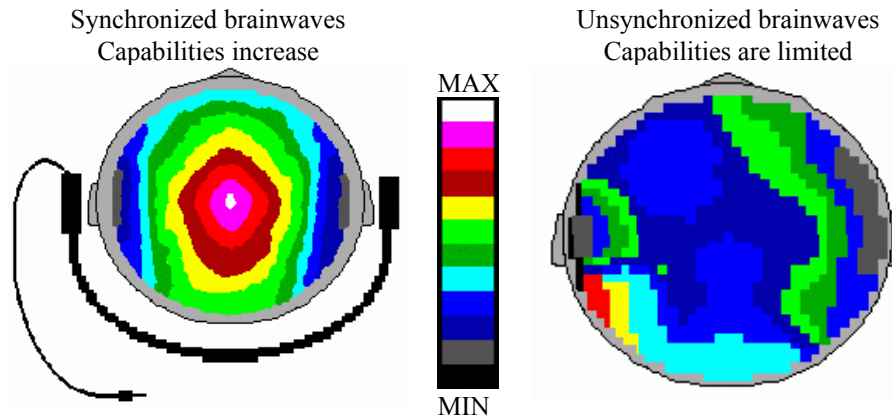


Figure 3 – Synchronization

4.3. Brainwaves and consciousness

The problem of consciousness has remained unresolved to date (Raković & Koruga, 1995, Rakić et al, 1997, Raković, 2008, 2009). This has given a new impulse to the research of the phenomenon of consciousness as the most complex brain function. The problem of consciousness is certainly important because of its implications upon medicine, biology, physics, engineering and philosophy. Modern neurologists have found the location of the thinking process in the brain and they say that the consciousness is the result of electro-chemical neuron activity. In physics the phenomenon of the relationship between the consciousness and thinking is manifested as a non-local phenomenon, i.e. as non-locality of quantum theory. The systems at large distances do not exchange data at light speed, but instantaneously. A frequently used example is that of a butterfly in Thailand: the flap of butterfly's wings in Thailand will set off a tornado in America. Therefore, consciousness and thinking have non-local character and represent an indivisible entity. This is still an unresolved phenomenon and due to the impossibility of direct measuring of the field of thinking or consciousness, the scientists are forced to measure the electric potentials of the brain – brainwaves, which are manifested by neurological brain structure.

4.4. The control of video games

In their Dublin laboratory, the Massachusetts Institute of Technology has presented the wireless control of video games coming directly from the brain of a player. The whole idea is based on the measurement of various frequencies of

certain parts of the brain at six different points, Figure 4, (Green, C. S., 2003, Glazer, S. 2006) which give the various responses of visual cortex.

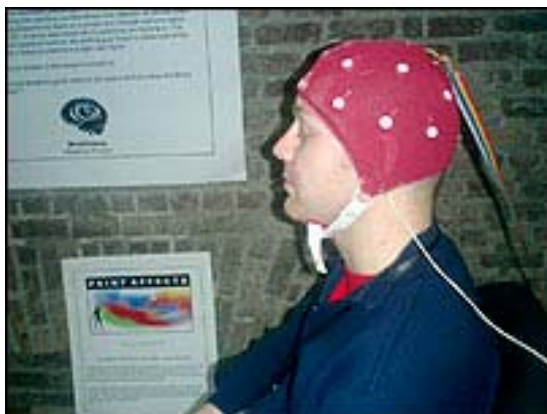


Figure 4 – Brainwaves' frequency measurement

5. Conclusions

The results of the analysis of brainwaves' photon features may be summarized as follows:

- Brainwaves' photon features are equally determined by means of their translation characteristics (photon momentum) and rotation characteristics (photon spin). The analysis has been made with double coherent Hamiltonian of a single photon.
- By means of coherent Hamiltonian, it could be concluded that brainwaves' photons are hybrid excitations of vacuum photons and spin excitations.
- The main characteristics of the obtained hybrids are dependence of energy on the direction of propagation and damping (lifetimes of hybrid excitations are finite).
- The system of brainwaves' photons has rather high internal energy because their real parts of dispersion law are rather low.
- Special computer systems have been designed for application of brainwaves in new method of "brain fingerprints", brainwave synchronization, and brainwaves and consciousness.

Finally, it is very important to point out that damping, present at all brainwaves, represents the protection of the brain from destruction, which might be caused by a very high internal energy far exceeding the usual values.

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MOŽDANI TALASI I MOŽDANI OTISCI

Rezime

U radu je izvršena analiza ljudskog mozga kao izvora niskofrekventnih elektromagnetnih talasa. Korišćenjem aproksimacije približne druge kvantizacije određene su energija i vreme života moždanih talasa, kao i unutrašnja energija sistema moždanih talasa. Zaključeno je da moždani fotoni imaju ekstremno niske energije i predstavljaju hibride vakuumskih fotona i spinskih talasa. Energije moždanih fotona imaju jako prigušenje. Veličina prigušenja zavisi od pravca kretanja. Unutrašnja energija sistema moždanih fotona je veoma visoka, ali zahvaljujući kratkim vremenima života ne dovodi do razaranja moždanih ćelija. Sistem moždanih fotona ima daleko veću unutrašnju energiju od odgovarajućeg sistema vidljivih fotona. Ovaj zaključak je kompatibilan sa činjenicom da pomoću moždanih fotona mogu da se savijaju i pomeraju metalni predmeti. Ove karakteristike moždanih talasa nalaze primenu i u forenzici. Konstruisani su posebni kompjuterski sistemi sa direktnim pristupom ljudskom mozgu koji detektuju moždane talase nakon prikazivanja prizora zločina osumnjičenih, a pre nego ispitanik bude u stanju da sam utiče na tok svojih misli. Na taj način stvaraju se «moždani otisci» koji su pouzdaniji od rezultata emotivnih reakcija ispitanika na postavljena pitanja koje daje klasični detektor laži. Sinhronizacija moždanih talasa koja može da omogući prečicu za postizanje dubljih stanja svesti i neobičnih sposobnosti u veoma kratkom periodu. Naučnici mere električni potencijal mozga – moždani talasi, koje ispoljava neurološka struktura mozga. Kontrola video igrice vrši se direktnim pristupom mozgu igrača bez žica.

Summary

The paper analyzes human brain as a source of low frequency electromagnetic waves. The approximation of second quantization was used to determine the energy and lifetime of brain waves, as well as the internal brain wave energy. It has been concluded that the brain photons are of extreme low energy and they represent the hybrids of vacuum photons and spin waves. Brain photon energies have strong damping. The size of damping depends on the direction of movement. The internal energy of brain photon system is rather high, but thanks to short lifetime it does not result in brain cell destruction. These characteristics of brain waves are applied in forensics as well. Special computer systems have been designed with direct access to human brain, which detect brain waves after the images of suspect's crimes have been shown and prior the respondent is able

to influence the flow of his thoughts. In this way the brain fingerprints are made which are more reliable than the results of emotional reactions of respondents to questions asked during the traditional polygraph testing. Brain wave synchronization can provide a shortcut for reaching deeper state of consciousness and unusual capabilities within a short period of time. Scientists measure the electric potentials of the brain – brain waves, which are manifested by neurological brain structure. The control of video games coming directly from the brain of a player.

DETECTION METHODS FOR ILLICIT TRAFFICKING IN RADIOACTIVE MATERIALS

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Abstract: From the accident in *Chernobyl* until today, there is further interest in the detection the illicit trafficking of radioactive materials. Our country is involved in this process from the beginning. The *International Atomic Energy Agency (IAEA)* defined the area of illicit trafficking as the action relating to the “receiving, possessing, using, transferring, or disposing of the radioactive materials without authorization”. Our country was absent from the United Nations for more than 10 years, because of the international economic sanctions and the warfare environment, as well as from the IAEA which left consequences on the aspect of being late in the implementation defined procedures for the detection of radioactive materials at border crossings. Methods to detect the illicit trafficking are a complex system that includes equipment, trained people and organization. This work gives some results in efforts made against the illicit trafficking of radioactive materials in our country in the past, and it is an attempt which the *IAEA* expects from us to point the possibility of its further development, as well as to clarify the part of our plan in near-future guidelines.

Key words: *IAEA*, illicit trafficking, border crossings, radioactive materials, detection, detectors

1.Introduction

Serbia is located at the crossroads of many international routes. Among other things, illegal goods are transported along these roads. In the heart of all forms of illegal trafficking as their most dangerous and most harmful ones, are

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illegal arms trafficking, drug trafficking, trafficking in people and illegal trafficking in radioactive materials.

After the Chernobyl accident and several other ones that indicate the possible existence of illicit trafficking of radioactive materials (Vejnović, Benderač & Ristić, 1994; Vejnović, Benderač & Ristić, 1991), it has become clear that the detection of illicit trafficking in nuclear and radioactive materials must be done in a modern way, if you want success in such activities. On the other hand, there is a very strong public interest in preserving healthy environment, particularly after bombing, and waste large amounts of depleted uranium in the environment in our country and the neighboring Republic of Srpska (Ristić, Benderač, Vejnović, Orlić, & Pavlović, 1997; Davidović, Baroš, Vejnović & Benderač, 2001). It can be concluded that it is possible to prevent criminal and terrorist actions in the use of nuclear and radioactive materials, it is necessary to have at disposal the sophisticated equipment for detecting and locating sources of radiation and laboratories for their identification and characterization as well as professional personnel to assess risks and it is necessary to prescribe measures.

In the period from 1987-1992 at the border crossings Horgoš, Kelebija, Vatin, Batrovci, Preševo, Gradina and Đeneral Janković, the Institute of Security has installed radiation monitors MZ-100 (Laboratory of Nuclear Engineering "Vinca"), by order of the Federal Government. Also, the Institute of Security installed the same type of radiation monitor in the port of Bar (Vejnović et al., 1991). All the monitors have been installed in the function of the preliminary control. Some of them are still in functional condition. The border police reported alarm activations more than 30 times. In most cases we dealt with the export or import transfer of cargo with higher contents of natural radio-nuclides, grids for gas lamps, for instance. One case related to the detection of increased concentrations of radionuclide in the air, which was later confirmed by gamma-spectrometric analysis of fall-up. But after the collapse of the former Soviet Union the number of different reports in illegal trafficking in radioactive materials increased. In this period, there is an interesting case of detection of radiation sources at the Presevo border crossing - the source of cobalt-60, activities ~ 1 GBq.

In addition to monitoring border crossings, radiological controls of goods imported under the environmental, sanitary, veterinary and phyto-sanitary supervision were performed (Benderač et al., 2005). Having detected more than 10 cases of problematic samples justifies fully the existence of such control, but also leads to the question: "Do the certificates accompanying the goods are imported in accordance with the facts? " Some obvious abuse of the legally set limit values of concentration of radionuclide, especially food, have brought into question the legislation and asked for interventions in the existing legal framework.

In the period of the last five or six years from the aspect of illegal trafficking in radioactive materials for our country there is a global international interest and it can be expressed through the important activities undertaken by the International Atomic Energy Agency in 2004. The IAEA expert team makes sure that Serbia has a long experience and results in the specified area and is aware of its great task ahead, in which way to realize fully the detection of radioactive materials at border crossings according to the protocol defined by the Agency. If we look back at the period of the 1990s, we can note that the Expert Committee of Radiation Protection, which had worked within the former Federal Government, registered the existence of the risk in illicit trafficking in radioactive materials, properly assessed the development trends of the risk and risk management measures taken in accordance to the assessment. At the same time, they have installed stationary radiation monitors at border crossings. It was envisaged to include all Border States, but because of the known events related to its disintegration it was partially completed only within the area of the new state, which included Serbia and Montenegro (Vejnović et al., 1994). This experience is applied later to the establishment and performance of radiological controls at the borders of the Republic of Serbia (Vejnović & Davidović, 2002).

The IAEA recommends that radiological controls at border crossings include the following (108 IAEA Report, 2004):

- the customs and border police to be equipped with a dosimeter pager (for the detection of gamma/neutron radiation);
- the stationary radiation monitors to be installed on border crossings (for the detection of gamma/neutron radiation), and
- the representatives who are professionally engaged in the radiation protection, equipped with manual dosimeter (alpha, beta, gamma and neutron detectors) and portable spectrometers should be present at the border.

The IAEA recommended that the Institute of NS "VINCA" performed the additional control at border crossings. It should be noted here that the incident requires the engagement of a number of other agencies and experts which must be involved in the part related to the management of the consequences caused by the incident. It is necessary to perform repair and minimize the damages and provide the further process of work and life. In that case, the investigation, data collection, dosimetric control, decontamination, medical research, etc., must be done.

During the last 10 years, about 15 cases of illicit trafficking in radioactive materials have been registered in Serbia. The current protocol detection at border crossings is the responsibility of the relevant Ministry, which deals with environmental protection and the approved institute in the field of radiation protection. Which ones are close and which policies need to be upgraded to a pro-

to be in accordance with the recommendations of the IAEA? As a first step certainly, there is a great job in staff training, where the IAEA expert team recommended the development of appropriate training programs that would include basic training and periodic refreshment courses. This training would be conducted by the relevant institutions in Serbia.

2. General characteristics of radiological control

In the aspect of general international interest, the IAEA defines the general potential threats that may arise regarding the illegal trafficking in radioactive materials. In that case, some important points of terminology were defined to determine the sphere of interest for easy communication, to define threats, monitor and study the crisis events that are related to the illegal trafficking in radioactive materials, to define measures of protection, to carry out individual risk assessment, to prescribe the ways of managing risks and to take preventive technical measures, and to determine the basis of protection:

a. The illicit trafficking in radioactive materials is a part of criminal activity that includes (Benderać et al., 2005):

- the theft of nuclear weapons;
- subversive activities, such as breach of control proliferation (as subversive to the international will);
- other actual or potential malicious acts aimed to cause harm to the people or the environment;
- profits earned illegally and profits from illegal sales of radioactive materials;
- avoiding payment of the prescribed legal costs for packaging, storage and protection;
- disregard of the positive legal regulations connected with transport.

b. Terminological definition of the radioactive materials

In the field of radiation, protection experts have always differed as to the concepts of radioactive material and nuclear material. Nuclear material is more dangerous, because of possible abuse. But if you ignore these differences and understand that radioactive materials can be very dangerous too, then the way of environmental protection, from both types of material, must be done within the same system. Nuclear material is always radioactive. Term "radioactive material" includes nuclear materials, and is used to avoid repetition of phrases "nuclear and other radioactive materials". Nuclear material is important and of primary interest, from the standpoint of illegal trafficking.

c. Four threats of nuclear terrorism are (Vejnović & Pavlović, 2008):

- the theft of nuclear weapons;
- the theft of materials for making improvised nuclear explosive devices;
- the theft of other radioactive material for RDD;
- sabotage of facility or transport;

d. All types of illicit trafficking incidents in the period from 1993 to 2003

According to the IAEA, the total reported incidents from 1993 to the end of 2007, were 1340, confirmed by the members of this organization, about 100 countries, and only a few by the non-member states (the IAEA Report, 2008). From 1340 incidents that are confirmed, 303 incidents are related to the illegal possession of appropriate criminal action in relation to these (Figure 1), 390 incidents are the theft or loss of radioactive material, and 570 incidents are related to other unauthorized actions. For the remaining 77 incidents, the information provided in the reports do not give the possibility to determine the category of incident.

e. Protection measures

- Some member states have decided to place radiation detectors at border crossings to try to detect radioactive materials that enter the country illegally, and to find the abandoned sources (which are out of evidence) that may be the subject of uncontrolled traffic and trade.

f. Strategic assessment that some of the countries need to control the border is:

- The decision of some member-countries whether, when and where to establish the detection of radiation on their borders. It should be the result of development of the overall national strategy to establish control over radioactive materials.

- The Guidelines about the design and implementation of such national strategies are the part of the IAEA Action Plan for safety and security of radioactive materials.

- The factors in the development of national strategies are the analysis of threat and risk assessment. At certain border locations for some countries the control can be as important as their overall strategy.

- The checkpoints or nodal points where there is a large flow of people, postal items, personal things and goods. These locations may be checkpoints that already exist for other purposes, such as control points for measuring the vehicle weight or for customs checking.

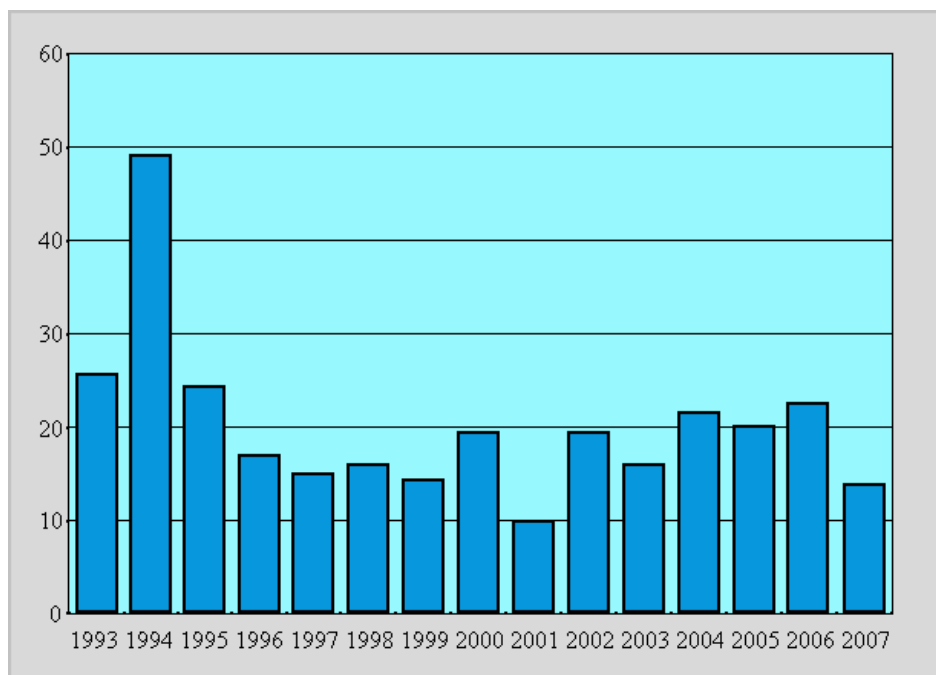


Figure 1 - Distribution of incidents related to illegal possession of radioactive material, per year, for the period 1993-2007

g. Types of instruments for detecting radioactive materials at border crossings

Instruments can be divided into three categories (Vejnović et al., 2002):

- Pocket instruments are small instruments, with low mass and are used to detect the presence of radioactive materials and to inform users about the levels of radiation.

- Measuring instruments have high sensitivity and can be used to detect, locate, or (for some types of instruments) identify radioactive materials. Those instruments may also be useful for making precise measurements of doses to be determined by the security requirements of radiation.

- Fixed, installed, automatic instruments are designed to be used at checkpoints such as those on road and railway border crossings, airports or ports. Such instruments can provide high sensitivity of continuous monitoring of the flow of persons, vehicles, luggage, packages and freight, while minimizing the interference in the traffic flow.

h. Instruments' purpose

- Detection: Instruments should only activate the alarm if a certain level of radiation is exceeded.
- Verification: When the alarm is activated, it is necessary to verify whether it is true. One way is to use the other instrument.
- Assessment and localization: The real alarm requires the search, and localization of the origin of radiation. In this case it is important to do radiological assessment for radiation safety and to determine the appropriate level of response as well.
- Identification: Determining the type and energy of radiation will often identify radionuclide, too. This will help categorize the nature of the case and future response.

3. Fixed installed instruments

- Fixed installed radiation monitors are often known as portal monitors, and also consist of a detector field in one or two vertical pillars with a joint electronics. Since the sensitivity of the instrument largely depends on distance, it is important to bring the person or vehicle as close as possible to the detection field.
- The highest sensitivity is achieved if the monitors are installed so that all pedestrians, vehicles and cargo traffic are forced to pass through or between the screens (Figure 2). It is necessary to carefully consider the selection of the optimal location to install fixed radiation portal monitors so that they would be most effective.
- Instrument effectiveness significantly depends on its ability to measure the intensity of radiation in the zone of control. It is therefore important to take into account, when installing the monitor, that the detector should be positioned to control zone clearly and without obstacles.
- Sensitivity to gamma radiation: It is recommended that at the average indication of $0,2 \mu\text{Sv}\cdot\text{h}^{-1}$, the alarm should be activated when the dose increases for $0,1 \mu\text{Sv}\cdot\text{h}^{-1}$ in a period of 1 s.
- Sensitivity to neutron radiation: For instruments that have the possibility to detect neutrons, the detector should activate an alarm when it is exposed to neutron flux from ^{252}Cf sources of 0.01 mg (approximately $20.000 \text{ n}\cdot\text{s}^{-1}$) in a period of 5 s, at a distance of 2m, when the gamma rays are protected in less than 1%. The probability of detection of this alarm condition should be 99.9%, i.e. no more than 10 faults in the 10,000 exposures. Neutron dose that corresponds to these states of radiation is about $0.05 \mu\text{Sv} \times \text{h}^{-1}$.



Figure 2 - Portal monitors to detect radioactive sources in road transport at border crossings

4. Conclusion:

The main conclusion that results from a number of incidents and trends of their mild increase is not only that the radiological controls must exist but it should be further developed and improved.

The methods for detecting illegal trafficking in radioactive and nuclear materials are a complex system that requires certain material, organizational and legal assumptions.

It is impossible to make effective and efficient system without the involvement of complex, expensive and high quality equipment and trained personnel. Laboratories that have the task of identify and measuring the radioactive radiation sources must be organized in accordance to the applicable standards in this field. Therefore the system must be multifunctional project that includes several components of protection.

Special attention should be paid of the people who need to perform radiological control at border crossings. There is a necessity of constant education and training of border police and customs at border crossings. In order to main-

tain the control system on constant and high level, it is necessary to develop a system of quality control. This system must include a system of inspections by authorized bodies but also some special exercises and tests.

Due to the large public interest the control of food supplies, medicines and items of general use should be done on continuous level. According to our experience and to the experience of the neighboring countries, especially Romania and Slovenia, the current radiological controls at borders, which is performed by operators of authorized institutions in our country, cannot be replaced by installing portal monitors and/or allocation of pager-dosimeters to customs or police officers without long-term preparation, training the personnel and defining of the protocols by the competent ministry for radiation protection.

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METODE OTKRIVANJA ILEGALNE TRGOVINE RADIOAKTIVNIM MATERIJALIMA

Rezime

Od akcidenta u Černobilju do danas postoji pojačan interes za otkrivanje ilegalnog prometa radioaktivnim materijalima. Naša zemlja je uključena u taj proces od samog početka. Međunarodna agencija za atomsku energiju (MAAE) je definisala oblast ilegalne trgovine kao radnju koja se odnosi na: "prijem, posjedovanje, upotrebu, transfer ili oslobađanje od radioaktivnog materijala bez ovlašćenja". Metode otkrivanja ilegalne trgovine je jedan složen sistem koji uključuje opremu, obučene ljude i organizaciju. Naša zemlja je zbog sankcija i ratnog okruženja bila odsutna više od 10 godina iz UN a time iz MAAE, što je ostavilo posledice sa aspekta kašnjenja u sprovođenju definisanih procedura detekcije radioaktivnih materijala na graničnim prelazima kako u tehničkom tako i organizacionom pogledu. U radu su dati neki od rezultata borbe protiv ilegalne trgovine radioaktivnim materijalima u našoj zemlji u prošlosti, i učinjen je pokušaj da se ukaže na mogućnosti njegovog daljeg unapredjenja kao i da se osvetli deo plana naših bliskih smernica koje od nas očekuje MAAE.

Summary

From the accident in *Chernobyl* until today, there is further interest in the detection the illicit trafficking of radioactive materials. Our country is involved in this process from the beginning. *International Atomic Energy Agency (IAEA)* defined the area of illicit trafficking as action relating to the "receiving, possessing, using, transferring, or disposing the radioactive materials without authorization". Our country was absent from the United Nations more than 10 years, because of the international economic sanctions and the warfare environment, also from IAEA which left consequences the aspect of being late in implementation a defined procedures for detection of radioactive materials at the border crossings. Methods to detect the illicit trafficking is a complex system that includes equipment, trained people and organization. This work gives some results in efforts made against illicit trafficking of radioactive materials in our country in the past, and is an attempt which *IAEA* expects from us to point the possibility of its further development, as well as to clarify the part of our plan in near-future guidelines.

PRINCIPLES AND STANDARDS OF CRIME RECONSTRUCTION

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Abstract: This paper deals with crime reconstruction as a method of crime investigation which represents a set of systematic, analytical processes which serve to provide relevant information about the manner of creation and dynamics of crime perpetration. Special attention is paid to ethical principles of crime reconstruction, as well as to the relationship between a scientific method and crime reconstruction method. In addition to this, basic information on models, scientific principles and practical standards of crime reconstruction have been presented. The subject of research is directed towards the analysis of determinants of creation of material pieces of evidence, as well as towards establishing theories and scientific principles for their analysis in order to deduct evidence admissible in court. Finally, the paper analyses the place of crime reconstruction within a complex procedure of its clearing up and proving.

Key words: crime reconstruction, crime-investigation analysis, material evidence, proving procedure

1. Introduction

Crime reconstruction is an investigating method, in other words a set of systematic analytical processes which provide relevant information on the manner of occurrence and dynamics of perpetration of crime. Analyzing the traces and objects as elements of crime consequence, a crime investigator endeavours to deduct objective conclusions about a criminal act, the cause of occurrence of every trace and its place within a system of traces.¹

¹ Traces represent a specific reflection of dynamic elements of a criminal act, i.e. coded information which show the sequence and manner of crime perpetration.

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The basic principles of scientific trace analysis, which includes crime reconstruction, have been established by Gross in his work *Criminal Investigation: A Practical Textbook for Magistrates, Police Officers and Lawyers* (Gross, 1924). According to Gross, methodical, systematical analysis of determinants of occurrence of every trace (fact) is required and necessary for the proving procedure. To be more precise, this is a starting assumption to avoid faulty and to provide objective and legally relevant conclusions. For Bell criminalistic analysis is a part of standard procedure of proving procedure – it is a brain every individual part of which must be identified by scientific methods in order to be completed (cited according to Chisum, Turvey, 2007). Doyle, a student and for a certain period the assistant to Professor Bell, based his novels about Sherlock Holmes on the importance of reconstruction and the role of methods of logic, deduction and induction in the evidencing procedure. Locard, a founder of the first police laboratory (Lyon, 1910) and one of the founders of the first International Academy of Criminalistics devoted his attention to the implementation of scientific methods in trace analysis (cited according to Kirk, 1953). In his works Locard particularly underlined the need of a multidisciplinary approach to evidence analysis, as well as the multidisciplinary nature of criminalistics. The important contribution to crime reconstruction was given by Kirk and his blood trace analysis. According to Kirk, material evidence cannot be faulty, it cannot give a false testimony, it cannot be completely absent, it can only be misinterpreted. Material evidence is always there waiting to be analyzed (Kirk, 1953).

In addition to material evidence, a testimony by a witness, a victim or a suspect can be a starting point for crime reconstruction. The perception of a criminal act by various subjects is also different – it is the result of the reflection of the act and the determinants of the criminal act in their minds. The perception of a person may not necessarily correspond to the objective actual position at the crime scene. The results of reconstruction depend on the observing of ethical principles of the profession, the application of scientific methods and the practical standards of evidence analysis.

2. Ethical principles and objective approach to evidence analysis

The results of reconstruction are directly conditioned by the professionalism which is manifested through professional (having the necessary knowledge related to the profession) and moral component (ethical code of a profession) of a crime-investigator's personality. The objective analysis of facts, i.e. pieces of evidence, implies the existence of professional integrity and independence of a person deducting conclusions. Objectivity is directly conditioned by the interaction of both external and internal factors. The crime investigator must be

aware of his objective capabilities and possible subjective influence, which must be eliminated in the course of crime clearing up.

Opposite the subjective and emotional there is the objective, which is based on ethics, the approach which starts from relevant pieces of evidence determined by scientific methods. A scientific method is an argument for an objective evaluation of pieces of evidence, the procedure which consists of establishing and checking of hypotheses (versions) on the way towards establishing the truth. Court decisions are reached based on objectively established facts, pieces of evidence or group of evidence. During the procedure of deducting conclusion the facts which are not in accordance with the set versions (hypotheses, assumptions) cannot be ignored, nor certain conclusions can and may be made if the facts confirming them are lacking. Only this is a correct and ethical approach to implementation of crime reconstruction.

Wishes and expectations of persons performing the reconstruction may influence their perception and analysis of the crime. Generally observed, the results of perception depend on the subject of perception, the circumstances under which the perception is carried out and the state of person's mind. As far as the phenomena of the effect of the observer, the effect of the context and the effect of the expectation are concerned, the knowledge of cognitive psychology should be taken into account. At the top, general level, the effect of the observer is an error in perception occurring due to some characteristic or the condition of the observer. Criminalists often, due to subconscious influence of a specific case, ignore the principles of cognitive psychology and the methodology of scientific research, which can lead to various interpretations of their conclusions. On the other hand, criminalists must be aware of what kind of results is expected from them. Ambiguous conclusions can be the consequence of the effort to supplement the incomplete, unreliable and undetected evidence. The consequence of a subjective approach can be the identification and interpretation of evidence based only on experience and belief that they are not only necessary but also sufficient for proper interpretation.

When deducting the conclusions in the procedure of reconstruction haste must be excluded and the pressure that the job must have already been completed should be rejected. The reconstruction itself must base on evidence, not on assumptions. The objective approach is contrary to acceptance of someone other's unverified attitudes, which may base on non-established and unverified facts, referring to emotions, warning the criminalist that his conclusions might stigmatize someone or even confined, warning that criminal act is actually an accident, diminishing the guilt of the accused, etc.

Narrowing the space for the influence of subjective factors (what he feels, or rather what he believes in), and the application of adequate scientific meth-

ods and procedures make the quality approach to deduct objective conclusions in the crime reconstruction procedure.

The application of ethical principles in the implementation of reconstruction is an essential element of both professional and objective conduct. Chisum and Turvey defined the starting assumptions based on ethical principles, from which any criminalist should start in crime reconstruction procedure (Chisum, Turvey, 2007). These starting assumptions are as follows:

- 1) As a performer of reconstruction, I (i.e. the criminalist, note by the author) plead for the application of the principles of science and logic, following daringly the truth no matter what it is;
- 2) As a performer of reconstruction, I confirm that the scientific spirit must be directed towards investigation, progressive, logical and unbiased;
- 3) I will never intentionally make a wrong conclusion (I will never allow the wrong impressions by which someone might influence my work);
- 4) As a performer of reconstruction, I will never present evidence which support only one side;
- 5) As a performer of reconstruction, I have only one professional requirement – truthfulness, accuracy, correctness and one ethical requirement – the whole truth and nothing but the truth;
- 6) Urgency in special cases must not be the cause of detachment from professionalism.

The first precondition in order to avoid errors is the existence of consciousness about the possibility of their occurrence. The power of moral, ethical conduct is directly proportional to the capability to resist conscious subjective elements. On the other hand, the professional requirement which is always before the criminalist is the consciousness of the need of critical analysis of his own acts and the necessity of constant improvement.

3. Scientific method and crime reconstruction method

Kind thinks that there are two types of criminalists who do the reconstructions – a criminalist-scientist (modern criminalist, author's note) and the criminalist-historian (the criminalist who does not apply contemporary scientific methods, author's note). The criminalist-historian makes the reconstruction intuitively, his work bases on experience which includes the picture and theory not supported by arguments about what happened. On the other hand, there is a criminalist-scientist, who analyzes every trace of the event and fits it into the whole picture (Kind, 1986). However, the expertise and competency of criminalistics cannot be connected to modern criminalistic conduct. In the past care was taken about the com-

petency and expert knowledge of persons involved in the parts of investigation, primarily crime scene investigation and reconstruction. (Zarkovic M., Kesic T., 2003).² Crime reconstruction is an activity based on forensic science, scientific method, analytical logic and critical thinking. The results of the reconstruction are directly conditioned by the use of scientific method, which defines the analytical procedure through the development and testing of hypotheses. The investigators seek the explanation of the set hypotheses by identification of pro and contra facts. The essence of scientific method is to define conclusions based on the data and not to define facts based on the conclusions. The scientific method of analysis consists of six stages which are connected in a circular manner (Bevel, Gardner, 2002):

- 1) defining the problem or question;
- 2) gathering data on the problem;
- 3) setting hypotheses;
- 4) classification and organization of data;
- 5) checking hypotheses;
- 6) defining conclusions.

The procedure starts with a question and generally ends with an answer which often raises another question. The accumulation of scientific knowledge about the concrete subject leads to the development of science. The scientific method consists of a synthesis of knowledge of investigating procedures and the correct usage of this knowledge. The conclusions derived in the procedure of reconstruction should not be a simple result of experiences (which should not be neglected), but the result of verified, checked hypotheses (versions) through the application of scientific method. A special group of errors consists of errors in application of logical methods, because of which every crime investigator should know the basic logical methods on which the process of conclusion is based. Logic is not only the science of laws and forms of thinking, but also of the most general laws of identifying the objective reality. The objectivity depends on the possibility to determine based on the consequence the structural

² Thus, for instance, by adopting the Code of court criminal proceedings of the Kingdom of Yugoslavia in 1929, crime scene investigation was regulated as both court and police action (the latter did not have any importance if not approved by the investigating judge) where two witnesses and the keeper of the minutes had to be present. When investigating a crime scene, the judge used his general knowledge and professional education, which were not sufficient, so he used to summon the persons who had certain specialized knowledge of some science or skill. Therefore, the law-maker did not realize then the need to investigate a crime scene by qualified persons. Also, an attitude remained recorded about the incompetence of lower police officers and gendarmes regarding crime scene investigation, considering that they did not have appropriate education and therefore could not understand and apply scientific and technical manners of investigation. Due to this, it was pleaded that their role was to secure the crime scene only, while the investigating authorities and experts (medical examiner and technical experts) performed crime scene investigation. Cited according to: Zarkovic M., Kesic T., (2003).

elements of action which caused the consequence in the first place. Realistic accomplishment of success is possible only if criminalistic assumptions are respected, especially those of causality built on logical bases, which increase the objectivity in deriving conclusions. The criminalist aims at his findings to be correct and his methods reliable.

Critical thinking, within the context of this paper, represents intellectual, goal-directed activity towards making conclusions about the evidence and criminal act. The basis of critical thinking is not made by the assumptions but it bases on the principles of science and scientific methods. Ogle thinks that this notion means careful and accurate evaluation and judgment the goal of which is to avoid general errors of logical concluding, in other words advocating of one hypothesis which is not supported by arguments (Ogle, 2007). In the procedure of scientific analysis of a criminal act there are often situations when a criminalist comes along a paradigm or contradictoriness of scientific and legal facts.

Scientific analysis of facts, the application of methods and principles of science make basic constitutive means with the aid of which the difference is made among assumptions, opinions, scientific facts and theory.

4. Practical standards of crime reconstruction

Practical standards represent fundamental rules of evidence interpretation in the course of crime reconstruction. The essence of reconstruction is made of not only the answer to the questions what, where and when, but also how and why. Crime reconstruction is the result of long-lasting and methodologically coordinated scientific procedure of analysis. This is the last step within the analytical procedure, where information held by every element of consequence at the crime scene are identified. The goal of the reconstruction might be defined as making conclusions about the criminal act based on information held by each concrete trace and system of traces as a whole of crime consequence.

The results of reconstruction depend on the used reconstruction technique, recommendations for the consequences analysis and practical standards. During the crime reconstruction the conclusions should be made in accordance with the dynamics of evidence occurrence. Various material pieces of evidence have various roles, possibilities and importance in reconstruction (traces of blood, weapons, arson, etc.). Information deducted by the analysis of various clues, as a segment of the plot (action), must be fitted into a whole, i.e. the picture of a crime plot.

All criminalists would have to strive towards objectivity and professionalism (expertise) in their work. The expert side of crime reconstruction is made of the application of principles of criminalistic science and scientific methods. The most important segment of forensic science is to establish professional stan-

dards.³ Practical standards are protection from ignorance, incompetence, misunderstanding and similar, which are explained by the scientific reasons. A great number of practitioners and scientists have given their contribution to defining practical standards of crime reconstruction, among whom a special place belongs to Chisum, Turvey, Rynersen, Bevel, Gardner, Gross, Kirk, Saferstein, Thornton, Locard, etc. The standards without which an objective reconstruction would be impossible are as follows (Chisum, Turvey, 2007):

- 1) A criminalist who performs a reconstruction should avoid all prejudice;
- 2) A criminalist performing a reconstruction responds by the reconstruction to the requirement to make a connection among all pieces of evidence and all pieces of information according to the chronology of their occurrence;
- 3) A criminalist is responsible to make conclusions whether a concrete piece of evidence is relevant to be used in the reconstruction;
- 4) A criminalist performing a reconstruction must, whenever possible, go to a crime scene;
- 5) The conclusions of the reconstruction and their starting assumptions must be in a written form;
- 6) A criminalist must demonstrate and understand the applied science, forensics and scientific method;
- 7) The conclusions of the reconstruction must be based on the established facts (only the established facts may be the basis of reconstruction);
- 8) The conclusions of the reconstruction must be valid, based on logical arguments and analytical thinking;
- 9) The conclusions of the reconstruction must be deduced using scientific methods;
- 10) The conclusions must demonstrate understanding and clear difference between object identification and determining a degree of its similarity (the use of precise terms is basis of understanding);
- 11) In his conclusions a criminalist must clearly and with arguments show that he understands the established sequence of pieces of evidence and Locard's principle of transfer;
- 12) Every piece of evidence, every piece of data or every conclusion on which the reconstruction is based must be available in documents, i.e. written papers it refers to.

³ In order to define the assumptions and guarantee the successfulness of police work in our country, various factors have been pointed out and underlined which in time got their expression in many professional police codes of conduct. They all highlight, as an important element, a promise to citizens that the police officers shall observe the highest professional standards when rendering their services to the citizens. Among other things, this means that every police officer aware of his responsibility for the quality of his professional work shall use every available possibility to extend and improve the level of his knowledge and competency. Cited according to Zarkovic M. (2003a)

The quality of a reconstruction is determined to a large extent by the quantity and quality of information, as a basis for deducting conclusions about a criminal act. In order to have all pieces of information available, it is necessary to have the following at one's disposal:

- 1) A list of subjects involved in the investigation;
- 2) The documents referring to a crime scene, including all collected pieces of evidence, protocols, notes, sketches and photographs;
- 3) The reports and notes by the subjects who rendered assistance in the course of crime scene investigation;
- 4) Forensic reports, notes and laboratory findings;
- 5) The reports of medical examiners;
- 6) A list of witnesses found at the crime scene;
- 7) Every document which includes a statement by a witness or the data about the suspect, including tapes, transcripts or reports on summary results and every other documents that contain facts about the criminal act.

5. Principles of evidence analysis in the course of crime reconstruction

Reconstruction is the goal of analysis of traces of a crime. Bevel and Gardner have defined a conceptual model of trace analysis in the course of crime reconstruction, which consists of four segments (Bevel, Gardner, 2002):

- 1) Collecting of evidence and information;
- 2) Evaluating objectivity and relevance of evidence and information;
- 3) Establishing importance of evidence (what is the basic nature of a plot segment and the specific piece of evidence), and
- 4) Connecting all segments of evidence and information and creating an objective, logical picture of a crime.

It is necessary to use system-structural method as a starting point of reconstruction of elements of criminal act (Krstic, 2000). Its use enables to identify the elements of criminal act more clearly, the mutual connection and relations of elements of action and consequences and the entirety of the criminal act system. The analysis triangle is the most frequent scientific frame for the analysis of crime elements (perpetrator, victim, crime scene). The characteristics of triangle elements represent the determinants which influence the possible shape of crime manifestation. Bevel and Gardner (Bevel, Gardner, 2002), as well as Ogle (Ogle, 2007), use the analysis triangle to identify the connections within the chronology of trace occurrence, i.e. of material evidence. A relevant piece of evidence is the evidence which occurred as a con-

sequence of criminal act, which manifests through the establishing of a link between a perpetrator, his victim and a crime scene. The analysis triangle explains also the possible connections and directions of transfer of materials and physical characteristics between the perpetrator and a victim, the perpetrator and the crime scene, and the victim and the crime scene in the chronology of occurrence of crime trace (transfer of evidence – traces of perpetrator's blood on the victim or victim's blood on the perpetrator, traces of perpetrator's or victim's papillary lines on the crime scene, traces of dust from the crime scene on the perpetrator, etc.). The transferred matters of the reflection of physical characteristics represent a proof of contact between the two objects (Locard's principle of exchange).

Analyzing the connection perpetrator-instrument-object of assault within the system of intertwining of things, events and processes, Vodinelic represented the transfer of matter within the process of a relevant trace occurrence (wound on the victim – traces of the victim on the perpetrator) by the following formula (Vodinelic, 1992):

$$\begin{aligned} A &\rightarrow B \\ B &\rightarrow A = A^1 \end{aligned}$$

In his analysis Lee uses four elements, and they are crime scene, victim, material evidence and perpetrator (cited according to Vernon, 2006). A trace becomes relevant only when its connection with the crime has been established. Thus, for instance, a trace of blood does not necessarily mean that a crime has been committed; it may be a consequence of accidental hurting. However, if such a trace is found on the knife after discovering a body with traumas that cannot be explained as suicidal according to the place where they were made, such a trace becomes evidence which should be connected with other elements of analysis triangle. In addition to the stated, it should take into account during the analysis of a concrete trace the changes that every trace may suffer in the course of time lapse (trace dynamics).

The analysis of every trace as a holder of information on the crime action should result in the answer to the following questions:

- 1) How did a trace occur?
- 2) What is his place within the system of traces as elements of criminal act consequence? and
- 3) What is the function of action element because of which the trace occurred during the criminal action?

⁴ A = perpetrator, B= victim; A1 = victim's trace on the perpetrator

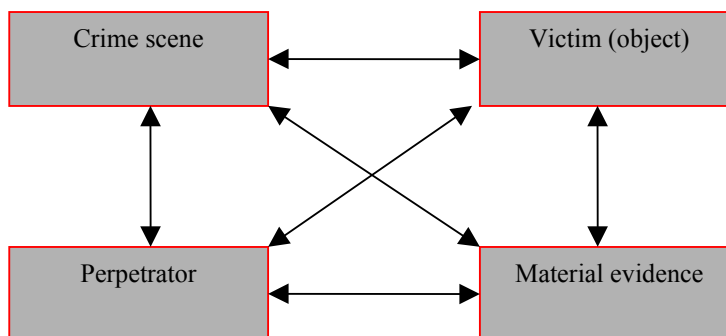


Figure 1: Concept of connections (according to Lee)

The objective answer to the question how a concrete trace occurred is possible to give by scientific establishment of his cause. Causality is a scientific principle the application of which provides for the objective approach to trace analysis. The principle of causality cannot be negated, only a misrepresentation of causality can be negated. Causality in forensics offers scientific basis for directing perception and thinking of a criminalist within the process of comprehension of relevant facts necessary to create an objective picture of a crime. Taking into account the principle of causality, in order to deduct objective conclusions on the cause of occurrence of every concrete trace, as well as on the chronology and dynamics of crime, it is necessary to take into consideration the characteristics of the action (causes) due to which every specific trace occurred:

- 1) The characteristics of the object, i.e. the object whose action caused a trace;
- 2) The type of activity (stab with a swing downwards, with a side swing, etc.);
- 3) The intensity of activity (the size of the wound together with the weapon suggest what physical force was used, and gunpowder residue, if firearms were used, suggests the distance of the shot); and
- 4) The position between the perpetrator and the victim at the moment of action taking.

According to Vodinelic, all those circumstances preceding the consequence of a criminal act are called antecedents (predecessors), and all things produced by the critical act can be called consequents, or consequences (Vodinelic, 1984). It is at that necessary to determine in the course of criminal act clearing up all antecedents (primarily by crime scene investigation), and then identify among them the one which was necessary and which can be considered a cause. The

cause of a certain crime is that previous occurrence, i.e. one or more antecedents, from which the forbidden consequence resulted unavoidably.

By the analysis of every concrete trace, we determine a specific causal connection at the relation cause-consequence, i.e. action-trace. Thus, for instance, in order for the elements of consequence of criminal acts of violence to be cleared up and connected into a logical whole, the following crime-investigating rules should be taken into account:

- 1) a trace represents a consequence (primary, secondary) of the perpetrator's or victim's actions;
- 2) each trace has another to follow, as a logical element within the system of elements of perpetrator's or victim's actions, and
- 3) within the causal relation between the perpetrator's action and the victim's action there is a trace of violence undertaken by the perpetrator (a trace of the perpetrator) and a trace of the victim's response (a trace of victim's defense).

Defining the segments of the action is carried out with reference to real or relative time of origination of the trace and carrying out of elements of the action which resulted in a trace as a consequence. Criminal act cannot be committed instantaneously. Bevel and Gardner use time windows or snapshots to identify the elements within the action system. Every trace at the crime scene is a necessary and logical consequence of the criminal act's nature and the manner of its commitment. It is an objective approach and the only way towards the truth, which is the goal of crime-investigation. The truth and non-truth are the qualities of the knowledge which depend on the objective approach of a criminalist (Bevel, Gardner, 2002).

6. Models of crime reconstruction

For Bevel and Gardner, reconstruction is the final element of analysis, and the reconstruction procedure consists of seven stages (Bevel, Gardner, 2002):

- 1) collection of evidence and using the entire evidence material, suitable for criminal act qualification;
- 2) establishment of specific parts of the picture or segments of a criminal act;
- 3) the analysis of the connection of every segment with other segments within the sequence of determined connections of crime segments;
- 4) the identification of a place within the line or sequence of every crime segment;

- 5) the analysis of all possible sequences and contradictory sequences where they exist, with the verification of evidence which may be more probable;
- 6) the identification of the final line or sequence within the criminal act;
- 7) establishment of a picture of the entire criminal act based on the established connection among all segments.

The reconstruction procedure was determined in a similar manner by Ogle as well (Ogle, 2007). Chisum and Rynearson start the reconstruction procedure from the concrete material evidence and their role within a criminal act. Focusing on the role that evidence has in time sequence analysis and the type of specific crime actions undertaken, Chisum and Rynearson defined the model of crime reconstruction (Chisum, Rynearson, 1997). The division of evidence provides for the fundamental answers to the questions which are the subject of reconstruction: who, what, where, when, how and very often why (Chisum, Turvey, 2007). When connecting the segments of the action, the construction of the time line of their occurrence is of extreme importance. Understanding the importance of identification of elements that make the action of a crime and taking into account the fact the plot of various crimes is made of various elements, Rynearson tried to determine a scheme of occurrence of elements of every criminal act (Chisum, Rynearson, 1997). Accordingly, the time line represents a quality basis for the identification of the sequence of their manifestation within the criminal act system. The time line allows the criminalist to keep attention to the global picture of the criminal act while not neglecting the details the presence of which is required.

The identification of a role is the process used to identify (come to life) the role of every participant in a criminal act, based on the developed hypotheses and theories of revision of potential actions (undertakings) by the individuals in a concrete criminal act or series of criminal acts. Every special place within the reconstruction represents a method of mind map, which analyzes evidence in the attempt to make conclusions about the motive and the manner of perception of a criminal act by the perpetrator.

7. Conclusion

The conclusions reached by the crime reconstruction are behavioural variables used in deducting conclusions of a criminal act. There is currently a lack of research of validity of conclusions deducted in the reconstruction procedure. Validity and reliability of crime reconstruction depend on the available evidence and forensic conclusions resulting from the evidence. If evidence of sufficient

quality are lacking, the predictions generated using this method must be deducted carefully and with clear understanding of the existing limitations (Hicks, Sales, 2006). The conclusions must be verified with the results of forensic analyses, i.e. to what extent the stated reconstruction conclusions match these results. Among other things, reconstruction is particularly important for perpetrator's profiling. In order to reach conclusions about the perpetrator, it is necessary to know what happened at the crime scene. Crime scene analysis contains many answers related to the perpetrator's motive, which cannot be understood by the fact that the crime has been committed (Chisum, 1998).

In order to improve crime reconstruction methods it is particularly important to improve scientific methods used in the reconstruction, as well as to educate the people doing the reconstruction. These two tasks are intertwined and without them there is no objective and legally relevant reconstruction.

The results of crime reconstruction, as of any other expertise, depend on the professional credibility of the criminalist working on it. Ogle presents a way of his perfection schematically by a four-angle pyramid, which consists of four various degrees of education narrowing at every following level, i.e. specialize towards the research of a group of specific problems (Ogle, 2007). After having passed all the levels, there is an expert in a certain field at the top of the pyramid, i.e. the person with a true expert credibility required for the expertise.

The professional and moral components are the basis of the efficient work within the evidencing procedure of a criminal act.

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PRINCIPI I STANDARDI REKONSTRUKCIJE KRIVIČNOG DOGAĐAJA

Rezime

Rekonstrukcija krivičnog dela se definiše kao skup sistematskih analitičkih procesa kojima se obezbeđuju relevantne informacije o načinu nastanka i dinamici izvršenja krivičnog dela. Polaznu osnovu u njenoj realizaciji čine materijalni dokazi, do kojih se najvećim delom dolazi na uviđaju, ali i iskazi svedoka, žrtve i okrivljenog. Pri tome treba imati u vidu činjenicu da je percepcija krivičnog dela od strane različitih subjekata različita, te da je rezultat odraza radnje i determinanti krivičnog dela u njihovoj svesti. Rezultati rekonstrukcije zavise od poštovanja etičkih principa profesije, primene naučnih metoda i praktičnih standarda analize dokaza. Takođe, oni su direktno uslovljeni i profesionalizmom koji se manifestuje kroz stručnu (posedovanje neophodnih znanja vezanih za profesiju) i moralnu komponentu (etički kodeks profesije) ličnosti kriminaliste. Objektivna analiza činjenica, odnosno dokaza, podrazumeva postojanje profesionalnog integriteta i nezavisnosti osobe koja izvodi zaključke. Poseban akcenat u postupku rekonstrukcije treba staviti na praktične standarde, kao fundamentalna pravila interpretacije dokaza u postupku rekonstrukcije krivičnog dela.

Summary

Crime reconstruction is defined as a set of systematic analytical processes which gives us relevant information on the manner of occurrence and dynamics of crime commitment. The starting basis in its implementation is made of material evidence, which is mostly gathered during crime scene investigation, but also testimonies of witnesses, victims and suspects. The fact that the perception of a crime by various subjects is various as well should be taken into account at that, and that it is the result of a reflection of the action and determinants of criminal act in their mind. The results of reconstruction depend on the observing of ethical principles of the profession, the application of scientific methods and practical standards of evidence analysis. Also, they are directly conditioned by the professionalism manifested through expert (possession of knowledge necessary for the profession) and moral (ethical code of the profession) components of the personality of a criminalist. The objective analysis of facts, i.e. evidence, implies the existence of professional integrity and independence of the person deducting conclusions. Special accent during the crime reconstruction should be put on practical standards, as fundamental rules of evidence interpretation within the crime reconstruction procedure.

FORENSIC DETERMINATION OF PAINTING AUTHENTICITY USING
INFRARED SPECTROPHOTOMETRY, SCANNING ELECTRON
MICROSCOPY AND INDUCTIVELY COUPLED PLASMA METHODS

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Abstract: The subject of the expertise was the painting which was attributed to Serbian painter Sava Šumanović, but suspected to be a forged one. There is the Sava Šumanović's signature in the corner of the painting. The suspected painting was reconstructed by gluing the old painting to new cloth and stapling it to the frame. The major point of physical-chemical analyses was the analysis of paint, especially white and black paints on the painting. The sampled paint was compared to the paint from the original painting by the same author. For the purpose of the analyses the following methods were used: Infrared Spectro-photometry with Fourier Transformation (FT-IR), Scanning Electron Microscopy with Energy Dispersive Spectroscopy (SEM/EDS) and Inductively Coupled Plasma with Mass Detector (ICP/MS). The forensic expertise showed the difference in the organic and micro-elemental content between the suspect painting and the original one.

Key words: the painting, authenticity, forensic expertise, forgery

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1. Introduction

In this paper the procedure of determining the authenticity of the painting which was attributed to the significant Serbian painter Sava Sumanovic will be shown. The basic procedure includes physical-chemical methods which were used because of operative data which indicated the suspicion that the painting was a forgery.

It was necessary to determine if the colour sampled from the objective painting, through its own composition, differences of the colour from original paints by Sava Sumanovic, and using other parameters to determine if the suspected painting was authentic.

In forensic and faculty laboratories microscopic analyses were made using optical microscopes and physical-chemical methods: Infrared Spectrophotometry with Fourier Transformation (FT-IR), Scanning Electron Microscopy with Energy Dispersive Spectroscopy (SEM/EDS) and Inductively Coupled Plasma with Mass Detector (ICP/MS).

2. Physical-chemistry analysis

The first step of the analysis is visual and microscopic observing of characteristic places from which it is necessary to take the samples. Figures 1, 2 and 3 show the suspicious paint.



Fig.1: Paint with suspect that is forgery



Fig.2: Observing signature in the bottom right corner of the picture



Fig. 3: Signature - Sava Šumanović 1939

There are the samples of white and green paint from characteristic places of subject painting (the places where the paint is the “clearest” with very small content of contaminant), black paint from the signature “Caba” and the place where the layer of black paint must be thick (the place on the tree at the painting). These samples make suspicious samples.

The uncontested samples of white, green and black paint are sampled from original paintings by Sava Šumanović which are kept at the National Museum in Belgrade, Sava Šumanović Gallery in Šid and the Gallery of Matica Srpska in Novi Sad. These are the places which are visually the most similar to the places from which the paint of the suspicious painting is sampled.

The requirement of physical-chemical organic analyses is using the method of Infrared Spectro-photometry with Fourier Transformation (FT-IR), which is made by the instrument brand name “Thermo Electron Corporation” type “Nexus 670”, using ATR (Attenuated Total Reflection) techniques.

The requirement of physical-chemical inorganic analyses is using the method of Scanning Electron Microscopy with Scanning Electron Microscopy with Energy Dispersive Spectroscopy x –ray (SEM/EDS) and Inductively Coupled Plasma with Mass Detector (ICP/MS) (Maksimović,2000).

The analysis which used the electronic microscope was made in the Center for Electron Microscopy University in Novi Sad, using the instrument brand name JSM type 6460 LV (Joel Scanning Microscope Low Vacuum), with the unselfish help of Professor Miloš Bokorov. All the samples were scanned in many spectral regions, and due to this there was a wide range of scans (107),

and after that only the best results were selected. The ICPMS method was made in Department of Chemistry of Faculty of Sciences, University in Novi Sad, using ICPMS laboratory instrument brand name Perkin Elmer model ELAN 5000 ICPMS, with the unselfish help of Professor Ivana Ivančev-Tumbas, PhD.

After the organic analysis of white, green and black paints, it has been concluded that the functional groups, i.e. the wave numbers of spectral bonds of suspected samples do not match the functional groups, i.e. the wave numbers of spectral bonds of uncontested samples. (Figures 4 and 5):

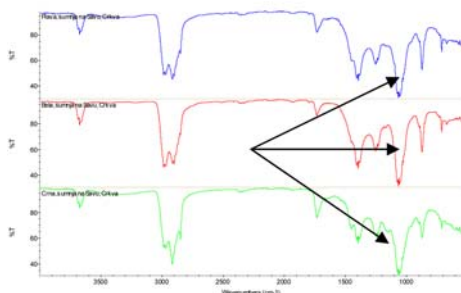


Fig. 4: IR spectra of suspected samples

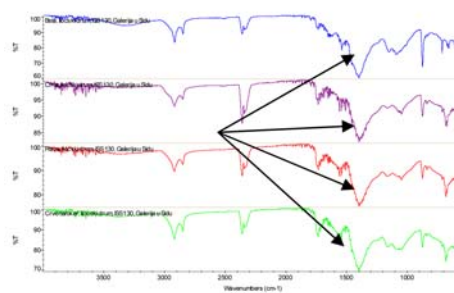


Fig. 5: IR spectra of uncontested samples

It is obvious that at the wave number 1070 cm^{-1} of suspected samples, there is one of spectral bonds which the uncontested samples (black arrows) do not have, on the other hand, at the wave number 1400 cm^{-1} of uncontested samples, there is one of spectral bonds which the suspected samples (black arrows) do not have.

After the inorganic analysis of white, black and green paints, it has been concluded that there is a mismatch in the micro-element composition. The results of analyses of green paint are used for the elimination reason mostly, because of significant oscillations of composition in both groups.

The suspected samples of white paint, among other things, contain chemical elements Ca (~ 21.1), Sc (~ 0.38), Zn (~ 0.45) and In (~ 1.33), on the other hand, the uncontested samples of white paint contain, among other things, chemical elements Zn (~ 25), Re (~ 2) and Pb (35). The intensity values are given in brackets.

The suspected samples of black paint contain, among other things, chemical elements Ca (~ 3.12), Sc (~ 0.1) and I (~ 0.2), on the other hand, the uncontested samples of black paint contain, among other things, chemical ele-

ments Cr (~0.2– 4), Zn (~15), Pb (~20–60). The intensity values are given in brackets.

The detection of chemical element Ca at the samples of white paint shows that there is a large quantity of it, which indicates the probability that Ca comes from gypsum which was added to the paint in order to make paint crack earlier and make the impression that is painting is older (A. Wallert, 1995).

Statements of micro-element compositions mismatching, based on the given results, are presented on the following SEM diagrams and tables:

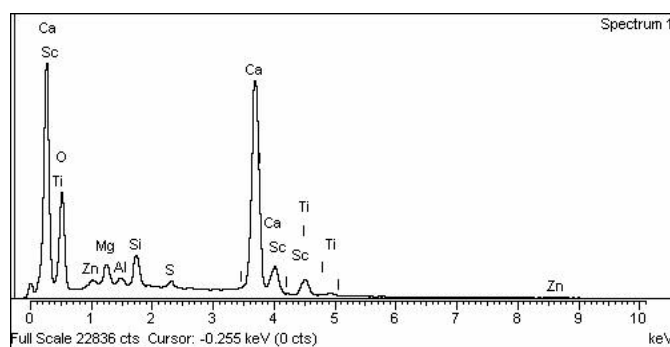


Fig. 6: Diagram of suspected sample of white paint

Table 1: Percentage share of chemical elements in suspected sample of white paint

Spectrum	In stats.	O	Mg	Al	Si	S	Ca	Sc	Ti	Zn	I	Total
Spectrum 1	Yes	67.54	2.95	0.65	2.82	0.55	21.01	0.38	2.31	0.45	1.33	100.00
Mean		67.54	2.95	0.65	2.82	0.55	21.01	0.38	2.31	0.45	1.33	100.00
Std. deviation		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Max.		67.54	2.95	0.65	2.82	0.55	21.01	0.38	2.31	0.45	1.33	
Min.		67.54	2.95	0.65	2.82	0.55	21.01	0.38	2.31	0.45	1.33	

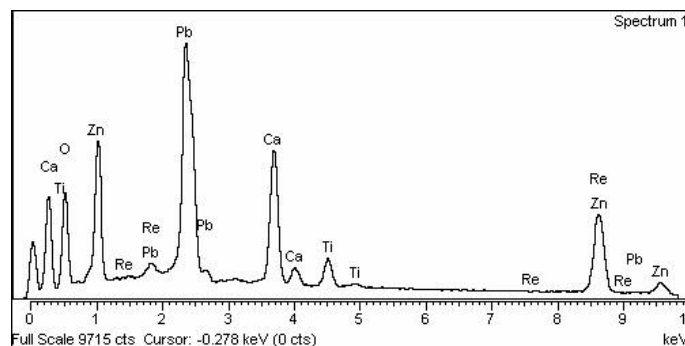


Fig. 7: Diagram of uncontested sample of white color

Table 2: Percentage share of chemical elements in uncontested sample of white paint

Spectrum	In stats.	O	Ca	Ti	Zn	Re	Pb	Total
Spectrum 1	Yes	34.68	9.48	2.58	19.25	2.01	32.00	100.00
Mean		34.68	9.48	2.58	19.25	2.01	32.00	100.00
Std. deviation		0.00	0.00	0.00	0.00	0.00	0.00	
Max.		34.68	9.48	2.58	19.25	2.01	32.00	
Min.		34.68	9.48	2.58	19.25	2.01	32.00	

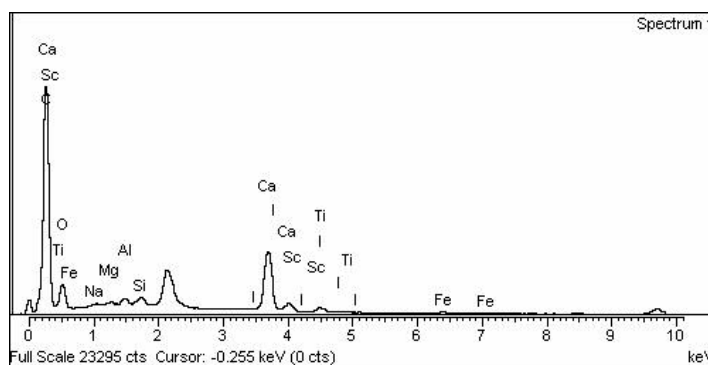


Fig. 8: Diagram of suspected sample of black paint

Table 3: Percentage share of chemical elements in suspected sample of black paint

Spectrum	In stats.	C	O	Na	Mg	Al	Si	Ca	Sc	Ti	Fe	I	Total
Spectrum 1	Yes	72.01	23.31	0.16	0.14	0.28	0.25	3.12	0.09	0.28	0.14	0.21	100.00
Mean		72.01	23.31	0.16	0.14	0.28	0.25	3.12	0.09	0.28	0.14	0.21	100.00
Std. deviation		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Max.		72.01	23.31	0.16	0.14	0.28	0.25	3.12	0.09	0.28	0.14	0.21	
Min.		72.01	23.31	0.16	0.14	0.28	0.25	3.12	0.09	0.28	0.14	0.21	

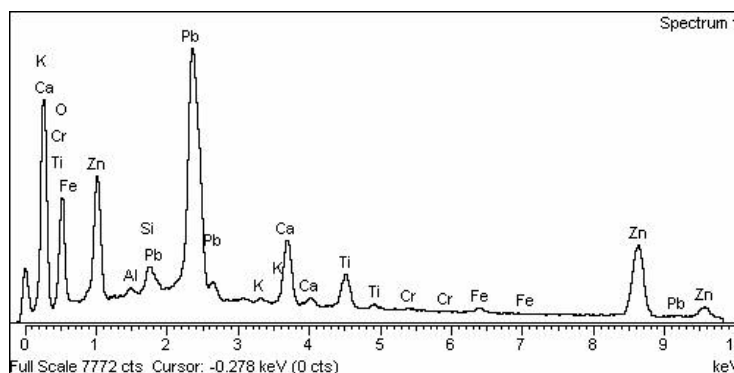


Fig. 9: Diagram of uncontested sample of black paint

Table 4: Percentage share of chemical elements in uncontested sample of black paint

Spectrum	In stats.	O	Al	Si	K	Ca	Ti	Cr	Fe	Zn	Pb	Total
Spectrum 1	Yes	35.18	0.48	1.56	0.34	4.94	3.01	0.21	0.46	19.29	34.54	100.00
Mean		35.18	0.48	1.56	0.34	4.94	3.01	0.21	0.46	19.29	34.54	100.00
Std. deviation		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	
Max.		35.18	0.48	1.56	0.34	4.94	3.01	0.21	0.46	19.29	34.54	
Min.		35.18	0.48	1.56	0.34	4.94	3.01	0.21	0.46	19.29	34.54	

3. Morphological analysis

After visual examination, it has been concluded that the suspected painting was reconstructed and conserved by gluing the old painting to the new cloth and stapling it to the frame. It is shown on Figures 10, 11, 12 and 13.



Fig. 10: The side view of paint moved from frame



Fig. 11: The closer view of gluing place old to new cloth



Fig. 12: Clearly evident gluing cloth

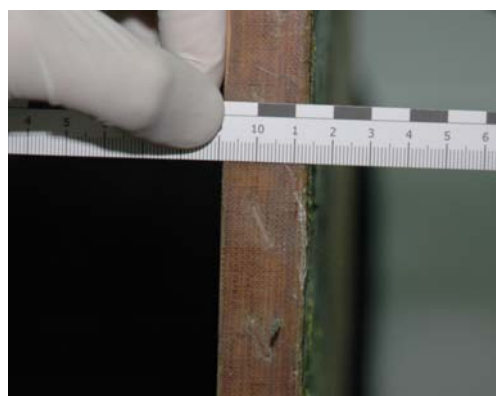


Fig. 13: Stapling on the side part of the paint

Morphologically observed (traceological, like the comparison of two traces Busarčević, 2001) there is mismatching of signatures of two authors, the first at suspected painting and the second at the original painting of Sava Šumanović. At the suspected paint, the letter “v” is oblique, like on the wind; middle of the letter “m” is on the half of height, on the other hand it is “pricked” and quite lower; the letter “o” by its upper part touches the letter “v”, on the other hand, there is no touching of the letter “v”.

All that was stated in the upper paragraph is shown in Figures 14-18:



Fig. 14: Signature on suspected paint



Fig. 15: Signature on original paint 1

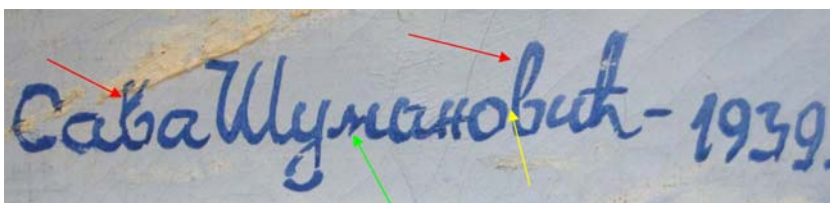


Fig. 16: Signature on original paint 2

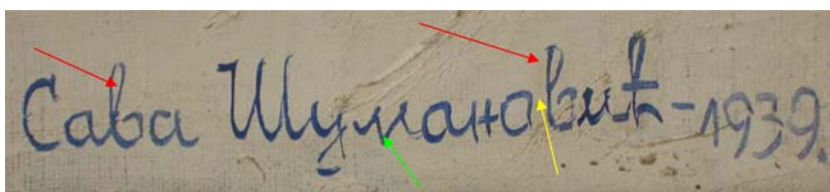


Fig. 17: Signature on original paint 3

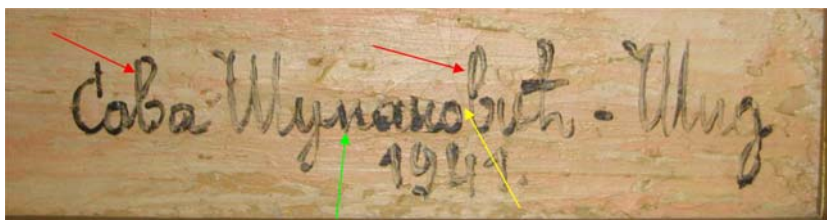


Fig. 18: Signature on original paint 4

4. Conclusion

Determination of the authenticity of the suspected painting (where it was proved a forgery of a painting which was attributed to famous Serbian painter Sava Šumanović) was made using of physical-chemical and morphological methods, contemporary instrumental techniques which are used in the most of forensic laboratories in the world (D. Dobkin, 2008).

A difference between forensic expert from laboratory expert and scientist-educator, is the manner of sampling, collecting traces and viewing places from which traces are sampled and the most important is the interpretation of the obtained results.

By this forensic expertise a pioneer's step is made of constituting the procedure for determination of forged paints in the Forensic Center of the Ministry of Interior of Serbia. The author of this work made a few more expertise of paints which were suspected to be forgeries (which confirmed the suspicions by police officers of the Division for the repression of smuggling cultural heritage of the Ministry of the Interior of Serbia) in the meantime. It is expected that a team which would work, among other things, on this type of forgeries will be made.

This work shows only a small part of the results of objective analyses and expertise, because of the limited space. This expertise has got an epilogue in court, and the people who have made this forgery were sanctioned in accordance with the Criminal Law of the Republic of Serbia.

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FORENZIČKO UTVRĐIVANJE AUTENTIČNOSTI UMETNIČKE SLIKE
KORIŠĆENJEM METODA INFRACRVENE SPEKTROFOTOMETRIJE,
SKENIRAJUĆE ELEKTRONSKE MIKROSKOPIJE I INDUKOVANE
SPREGNUTE PLAZME

Rezime

Predmet analize je bila umetnička slika koja se pripisuje srpskom slikaru Savi Šumanoviću, za koju je postojala sumnja da je falsifikat. U uglu predmetne slike se uočava potpis autora Save Šumanovića. Sumnjiva slika je bila restaurisana i konzervisana u smislu podlepljivanja platna i "municijom" heftalice pričvršćena za ram. Težište fizičko-hemijske forenzičke ekspertize je stavljeno na boju sa slike, naročito belu i crnu. Takođe je analiziran i potpis na predmetnoj slici. Uzorkovana boja je upoređivana sa uzorcima boje sa originalnih slika navedenog autora, koje se nalaze u galeriji Save Šumanovića u Šidu, Narodnom muzeju u Beogradu i Galeriji Matice Srpske u Novom Sadu. Za potrebe analiza korišćeni su standardni forenzički metodi: infracrvene spektrofotometrije sa Furijeovom transformacijom (FT-IR), skenirajuće elektronske mikroskopije sa energetski disperzivnom spektroskopijom x-zraka (SEM/EDS) i metod induktivno spregnute plazme sa masenim detektorom (ICPMS). Forenzičkom ekspertizom ispitivanih uzoraka dokazana je razlika u organskom i neorganskom-mikroelementarnom sastavu uzoraka sa sporne slike i uzoraka sa originalnih-nespornih slika. Rezultati sprovednih analiza su upotrebljeni u sudskom postupku i na osnovu njih je donešena i presuda.

Pomoću metoda fizičko-hemijskog ispitivanja uzoraka boja i platna, kao i na osnovu metoda trasološko-mehanoskopskog ispitivanja karakteristika na bojenom sloju, platnu i ramu, potvrđena je autentičnost umetničkih slika i u daljoj praksi Forenzičkog Centra MUP-a Srbije i dobijeni rezultati su dali pozitivan epilog u sudskom postupku, tj. sprovedenim analizama su dokazani falsifikati.

Summary

The subject of the expertise was the painting which was attributed to the serbian painter Sava Šumanović, but suspected to be a forgery. There is the signature of Sava Šumanović in the corner of the painting. The suspected painting was reconstructed and conserved by gluing the old painting to a new cloth and stapling it to the frame. The major point of the physical-chemical analyses was the analysis of paint, especially white and black paints on the painting. In addition to this, the signature on the painting was analyzed using method of traceology. The sampled paint was compared to the paint from the original painting by

the same author, which was investigated in the Gallery Sava Sumanovic in Sid, the National museum in Belgrade and the Gallery Matica Srpska in Novi Sad. For the purpose of the analyses the following methods were used: Infrared Spectro-photometry with Fourier Transformation (FT-IR), Scanning Electron Microscopy with Energy Dispersive Spectroscopy x –ray (SEM/EDS) and Inductively Coupled Plasma with Mass Detector (ICP/MS). The forensic expertise showed the difference in the organic and micro-elemental content between the suspected painting and the original one.

The results of the implemented analyses are used in court process and they were the basis for rendering the judgment.

Using the methods of physical-chemistry investigation of the samples of paints and canvas and traceological-morphological methods of investigation of characteristics on the layer of paint, canvas and frame, the authenticity of the painting was confirmed and in the following praxis of the Forensic Center of the Ministry of the Interior of the Republic of Serbia and the obtained results resulted in positive epilogue in court, i.e. the implemented analyses proved the forgery.

TENDENCIES OF CRIMINALISTICS DEVELOPMENT IN THE 21ST CENTURY

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Abstract: The tendencies of criminalistics development deserve a particular attention. It is of a special importance from both scientific and practical aspects of criminalistics, criminal law and criminal procedure, and in general, all criminal law disciplines. The problem has a wider social importance. Criminalistics is one of the main factors in the fight against criminality. The battle against criminality in the future will depend a great deal on how the future criminalistics will be.

The paper aims to point to some general tendencies in the development of criminalistics that are present at the beginning of the 21st century, and which at the same time show the expected directions for the future.

Key words: criminalistics, development, 21st century

1. Introduction – Dynamics as an Important Characteristic of Criminalistics

Dynamism is an essential characteristic of criminalistics. That in itself is nothing special and dynamism has to be present in all sciences. However, dynamics is especially emphasized, and the most present within sciences that deal with criminality. Dynamism had a key role in the emergence of criminalistics, as a science of discovery and evidence of criminal acts, and has the same meaning for the development of criminalistics.

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1.1. Dynamics as a Vital Factor of the Emergence of Criminalistics as a Science of Discovery and Evidence of Criminal Acts

Dynamism had a cardinal role in the emergence of criminalistics.

In the Middle Ages criminal law was undifferentiated. Criminal codes have been dealing with both the incrimination of criminal acts and the procedure and execution of sanctions. In addition to this, criminal codes of late feudalism contained a great deal of *mandatory rules* for the discovery and evidence of criminal acts, which summarized the experience in the field (without scientific analysis), i.e. criminalistics knowledge of that era.¹

The raise in quantity and quality of knowledge and a faster specialization lead to the formation of separate disciplines dealing with criminality. Firstly, the substantial and the procedural criminal law have been separated, and thereafter criminalistics split from criminal procedure law.

A couple of essential factors contributed to the emergence of criminalistics as a science on prevention of criminality:

a) Radical social changes at the end of the 18th and at the beginning of the 19th century;

b) The fast development of science in general;

c) A great increase in criminality.

a) The ideas which culminated during the French Revolution led to the abolition of torture as a legal tool for determining the truth, and the system of legal assessment of evidence. The acceptance of the idea of free judicial assessment made unnecessary the legal incrimination of any guidance in terms of how to determine the facts. Because of that, criminal codes of the 19th century, the era of great reforms of criminal procedure do not contain those rules. The judiciary, especially the investigating judges, thereby gained much more freedom in their work, however at the same time they were left on their own.

¹ A good example is, for example, the Criminal Code of Maria Theresia (*Constitutio Criminalis Theresiana*) of 1768 that contained detailed and mandatory rules for determining the factual background of criminal acts. That is the case with the criminal act of money laundering in par. 5, Art. 63:

"Special questions regarding money laundering have to be asked within the following sequence: how he (the suspect – I.F.) came in the possession of the forging tools and the forged money that he has used or which has been found in his possession. If he names the person from which the objects have been obtained, his name and the transmission have to be described in details. Was he by himself making the falsified money (provided he has not named a person from whom he obtained the money), and if that is confessed, how often? How many peaces and from which metal? Where has he obtained the metal, the plate and other tools? How did he do the laundering? Which tools did he use and where did he find them? From whom did he learn forging, what is his name and where does he live? Did he spend the forged money? How much? To whom? Where? He has to name the place."

b) The fast development of science and technology produced a great amount of knowledge based on which the science on criminal **prevention** could be built.

c) The fast and radical social changes had their dark side too: an enormous increase in criminality which thereby requested efficient tools in discovering and evidence of criminal acts.

Therefore, the adequate *social conditions* existed, and a compelling *need* for scientifically based criminal prosecution that would be much more efficient from the existing, based on experience and general culture, was present. On the other hand, the necessary amount of scientific knowledge has been developed being accumulated in different scientific fields that *made possible* the development of a new branch of science. These three factors: the need of society and prosecuting organs, the development of science and a great increase in criminality were making an increasing pressure towards a formation of a *science* that would deal with the discovery, evidence and prevention of criminal acts and would lead to the building up of a scientifically based *practice* of criminality prosecution.

Under the pressure of a need for fighting against criminality in Europe from the 1830s scientific papers directed towards the development of criminal adjudication were published more frequently, in which authors emphasized the need for creating a science that would be dealing with the discovery and evidence of crimes. Being of a standpoint that the battle against criminality could be successful provided it is based on scientific methods and means, i.e. on scientific bases. The authors of those papers were in majority of cases liberal spirited judges and university professors, which rejected the formalistic rules of evidence of the earlier, feudal criminal procedure. In their papers they were giving recommendations regarding evidence in criminal procedure. They have been the immediate predecessors of criminalistics.

The pioneer work of L.H. Franz von Jagemann has to be emphasized and his work: „The Science of Judicial Investigation“² in two volumes. He dedicated the first volume to the theory of investigation. The main task of the first volume the author considered to be the elaboration of the rules on discovering and fixing the means of evidence. In more than 700 paragraphs he discusses the rules of crime scene investigation, seizure of objects, hearing of the accused and witnesses. In the second volume, after resuming the legislation and the principles on more hundreds of practical examples ranging from crime scene investigation to the execution of capital punishment, he shows the practical realization of different measures. Thereby, this work is not only a handbook, but provides for the elements of the basis of a new science.

² Handbuch der gerichtlichen Untersuchungskunde, Frankfurt am Main, Vol. I (1838), Vol II (1841).

The second half of the 19th century is the time of criminal law codifications in Europe. This process gave new incentive for scientific work. Using Jagemann's terminology and relying on his interpretations, in 1893 Hans Gross published his well known work: "The Handbook of Investigative Judge."³ Therein he made a systematization of the (until then) existing knowledge on criminalistics. He strongly advocated the use of contemporary achievements of science and technology in the investigation and some expertise, and pointed to the application of contemporary scientific achievements in fighting against criminality. Thereby, he determined the *principle strategic line* of the new science, which is kept until today. By introducing scientific achievements Gross gave interdisciplinary character to investigation.

L.H. Franz von Jagemann and Hans Gross can be considered the „fathers“ of criminalistics. By establishing the institutes of criminalistics (Louzanne of 1909; Graz of 1912, etc.), criminalistics finally gained its independence.

1.2. Dynamics as the Principle Characteristic of Further Development

Almost twenty years ago, one author⁴ was wondering whether criminalistics is dying. Time showed that not only the criminalistics is not dying but it lives a very dynamic development.

Considerable dynamism is determined by:

- the dynamics of criminalistics;
- the development of underlying sciences and its own achievements;
- the changes in the apprehension of needs and requirements of criminality prevention in the light of human rights and the principles of a lawful state.

2. The Main Line of Development of Criminalistics at the Beginning of the 21st Century

It is not easy to observe the tendencies of the criminalistics development in its entirety, due to the number of branches with varying content and a number of factors that influence their development, and due to constant and fast increase in the volume and structure of knowledge on criminalistics.

It would be easier to observe the perspectives of development of some branches like ballistics, dactyloscopy, etc. Still, some general tendencies can be derived, and in the following we are going to discuss them.

³ The third edition of 1899 he already subtitled: "As the System of Criminalistics"

⁴ Jaeger (1990)

2.1. The Application of Scientific Achievements

One of the main reasons why criminalistics emerged was the need to apply the achievements of natural and technical sciences in criminal procedure. The use of natural sciences also influenced the internal structure of criminalistics. The division of criminalistics into tactics and technics is mainly based on the fact that tactics principally relies on social sciences, while technics relies on natural and technical sciences.

Having in mind the qualitative and the quantitative indicators of the connection of criminalistics with other sciences (in the first place with natural and technical) some groups can be determined, regarding the quality of a connection.

To the *first group* belong the least worth, accidental, *ad hoc connections*, which are countless. Quite often, but still *ad hoc*, the knowledge of e.g. geology, zoology, metallurgy and the like is used. They are used in criminalistics without significant adjustments. Accordingly, no special requirements are applied towards the experts. They only have to possess the knowledge that is sufficient to answer the questions.

The *second group* is comprised of scientific fields *regularly* used in criminalistics. A strong link with these sciences significantly influences both sides. Dactyloscopy as such was originally studied by anatomy. A special branch of criminalistics is built on these discoveries. At the same time, criminalistics adjusted it to its needs, built a separate system of rules and made scientific research for its needs. Today the automatic system of identification based on papillary lines is already built. The achievements of optics and photochemistry related to photography are incorporated into criminalistics photography. E.g. the knowledge of anatomy on a feet, and the technical information on shoe production are incorporated into traceology; technical and ballistic knowledge on production and usage of firearms into criminalistics, etc. The integrative process is sometimes so strong and successful that all *ties* to the original sciences are *cut* and the future development follows according to the needs of criminalistics.

The *third group* is comprised of natural and technical sciences with which criminalistics is in a specific symbiosis, due to some areas, which are equal, both to criminalistics and some other natural or technical science.

In the criminalistic work the knowledge from chemistry, physics, mathematics, biology (especially microbiology), computer science, acoustics, etc. are used on a daily basis, and as a result of specialization and scientific development, the criminalistic chemistry, physics, mathematics, biology, computer science and acoustics are created. Usually during the criminalistic work, depending on the investigated object, the methods of various scientific fields have to be

used (e.g. in case of money laundry the analysis of paper, colour, means of adulterate, etc.). The usage of these methods usually requires a *high level of professional knowledge* that cannot be gained outside the original science.

On the other hand, due to the particularities in the use of this knowledge in criminalistics, the need for research aimed to help the adaptation, adjustment to the needs of criminalistic emerges. This research can be done in cooperation with experts from criminalistics and original science.

Tasks on the adjustment and construction of an applied science are important equally to the development of criminalistics as well as to the original science. A special requests of criminalistic use (e.g. the quantity of samples and the time needed for analysis), require building up of such a method in the original (mother) sciences that can later be used also in other fields of that science.

Criminalistics plays a key role in the prevention of criminality, one of the reasons for it, is because it collects, adjusts, further develops and hands over to the *practice* the scientific achievements from various areas of science in order to be used for preventive or repressive purposes. Their inclusion into the criminalistic apparatus becomes, with the development of science and technology, an increasingly complex task. The integration of contemporary, complex scientific achievements requires scientifically based *adjustment*, further *development* and *improvement* of those methods, and a scientifically backed *research* activity. In today's scientific and technical development, criminalistics can fulfil this task only by using its interdisciplinary scientific connections.

Criminalistics cannot be viewed outside the context of social relations and the need of society to end criminality (which is at the moment an unrealistic requirement), or to maintain it on an acceptable level (what is much more realistic). As a science, criminalistics have to be viewed in joint action with other sciences which have criminality as their object (substantive criminal law, criminal procedure law, criminology, etc.).⁵

2.2. *The Primacy of Criminalistic Technics*

As stated earlier, criminalistics knowledge grows and changes fastly. These changes are the most visible in the area of criminalistic technics that relies on natural and technical sciences, and is a result of the explosive development of those sciences in the last couple of decades. This advancement in the filed of criminalistic tactics, that is in the first place, based on social sciences, does not exist, and cannot be expected in the near future, due to the situation within mother sciences. The manner in which criminalistic technics developed is in ac-

⁵ This is also emphasized by the Serbian literature: Krivokapić (2001)

cordance with the intensity that mother natural-mathematical and technical disciplines are developed. It can be noticed, that the period for implementation of some novelties into criminalistic is becoming shorter. It is completely clear that such a tempo of development cannot be expected in the field of social sciences.

On the other hand, it can be observed that the evidence collected by criminalistics *tactics* is more often successfully rebutted in criminal procedure, due to its sources, method of collection and the level of authenticity of information, e.g. the unreliability of statements of witnesses and the accused is widely known.

The great number of *limitations* set by warranty provisions of the law should also be kept in mind.⁶

The efficiency of criminalistics is finally being proved in the courtroom.

It is a world-wide experience that *material evidence*, the authenticity of which is guaranteed by scientific methods of their discovery and usage, represents *principle evidence*. Those „incorruptible witnesses“ are the main trump of the prosecution. The tendency is that confessions are made by only those accused against which there are available evidence based on the achievements of natural sciences and technology. All other (subjective) data is (often rightly) minimized or questioned. From the above said it follows that the methods of criminalistics have much more potential of usage related to material than to personal evidence.

It has to be noted that criminalistics tactics increasingly relies on technology, especially informational technology. Here in the first place there are the methods and means of contemporary inspection (the use of computerized instruments for the preservation of (crime) scene outlook, 3D computer animation of (crime) scene outlook, the usage of lasers and invisible rays for discovering traces, etc.), further, different methods of planning (psychological and geographic profiling, ViCLAS and similar systems, the systems of criminal analysis, criminal mapping, etc.), computerized criminalistic records, different digitalized collection of samples, instrumental discovery of lie, etc.⁷ they cannot be imagined without modern information technologies.

At last, what remains the method of criminalistic tactics and which at least in the near future is not imaginable to be replaced by modern means of technology, is planning and organizing the criminalistic work, analyses and synthesis of collected data and the like – the thinking process, complex combinations and intuition.

⁶ In the USA it can be noticed that by invoking a fair trial, the validity of the imprisoned and accused person's statements are a priori put under a question mark.

⁷ For some of these methods see: Feješ (2002), *Savremeni kriminalitet i dokazno pravo*

It must also be noted that there is no chance to prevent the most dangerous ways of criminality, like organized crime, terrorism, commercial crimes, computer crimes, etc., without the use of the most advanced means of technology. It follows that criminalistics technics gradually gains primacy in contemporary criminalistics.

2.3. Minutiation

The tendency of criminalistics developments shows that it is capable of gathering relevant information from smaller quantity of materials in traces. However, at overall, even the use of the most advanced technology does not mean that the prosecution thereby gains advantage and goes ahead of tactics and technics. Namely, in order to counteract the increasingly growing potentials of contemporary technology, criminals build such methodology of crime execution that less adequate material is left for criminalistic expertise and analyses. According to some authors, it is a general tendency⁸ that the criminal elite (especially the organized crime, terrorists and the executors of other serious crimes) very fastly adjust to new tendencies and possibilities of criminalistics and intend always to be a step ahead. In pursuing that aim, they are ready to invest considerable sums of money, engage top experts, and the like. Their tactics and techniques of avoiding criminal responsibility thereafter fastly spread among the criminal population. The criminal methodology was until now, and is today, more developed than the methods and means of prosecution. The old experience, that prosecution is always behind criminals, remains valid.⁹ For that reason, the decreasing amount of materials left by perpetrators of crimes gains on its value, and directs the development of criminalistics technics towards further minutiation.

2.4. Internationalization

It is commonly known that contemporary crimes do not know for state borders. The process of globalization in gaining profit is present equally in the legal and in the illegal sphere. Because of that the prosecution has to be more internationalized. All countries of the world are interested in international cooperation, both in prosecution and in the science of combating against criminality, i.e. criminalistics. The first way appears in the form of mutual information, organizing common actions, etc., and the second, in the building up of complex standardized procedures of discovery and evidence. In relation to that the necessity

⁸ Fenyvesi (2004)

⁹ Good examples are the money laundering and the forgery. Forgers often possess better quality tools for making forgeries from the state.

arises of connecting and coordinating scientific work, databases and samples (fire arms, vehicle tires, etc.). The process of world, and especially European integration, and the harmonization of legal systems that follows those processes, significantly influences the acceleration in the development of those sciences that deal with criminality, and within them, especially criminalistics. In order to create an efficient system of criminal activity prosecution that is no longer aware of state borders, the coordination and harmonization of methods of discovery and evidence of criminal acts at international levels is necessary. With regards to that, the specialized international organizations are of special importance.¹⁰

2.5. Computerization

Computerization marked the end of the 20th century the overall social relations as well as criminality and criminalistics. Computer is an important tool both in terms of criminality and criminal prosecution. The use of computer for criminal purposes is a very dangerous mode of criminality with the expected fast development in the future. This requires the creation of a suitable criminalistics methodology for their discovery and evidence.

On the other hand, criminalistics gained a powerful tool in information technologies for dealing with its tasks. Computerization brought a number of new and efficient methods of discovery and evidence both in the area of techniques and tactics. Instead of enumerating (we have already mentioned some areas above), it has to be emphasized that contemporary criminalistics cannot be imagined without computer science. Computers have a wide potential of usage both in discovering and evidence of cases at hand, and also in research, database processing and communication, etc. Every prosecution subject is worth as much as the information it has. Computerization caused the emergence of a great volume of information. However, valuable pieces of information are only those that are relevant, a good quality data. This means that in order to gain relevant data, a great number of „raw“ data in computer databases have to be processed (analyzed, combined) in which the main role is still played by human beings. Often, a great quantity of general information is at disposal that has little value for a specific case, and contains only some relevant and specific data. A paradox emerges: a great quantity is available but still there is an information deficit. The need for international connection of databases¹¹ and the standardization of data arises. The latter faces difficulties due to different legal regulations of

¹⁰ Eg. ENFSI –FITEH, EDNAP, EAFS-EFTA.

¹¹ This idea is realized within organizations like the Interpol, Europol, EuroJust, Eurodac, Schengen Information System (SIS), that make possible a fast exchange of information, e.g. in case of motor vehicle theft.

national states. However, the need will force states to compromises and to a more elastic approach to this problem. Therefore, the progress is expected in this field, at least in Europe.

2.6. *Specialization*

Until the end of the 18th and the beginning of the 19th century no special expertise was required for criminal prosecution. In the majority of European states, until the beginning of the 19th century there was not any specialized organization for discovery and evidence of criminal acts that would base its activities on scientific knowledge. Until the formation of such specialized state organs the discovery of facts in connection with criminal acts was conducted based on general culture and life experience. Those tasks have been handled by military units stationed in fortresses and by constables, night guards and other underpaid staff of the local government, incompetent to handle the criminal prosecution based on expertise.

Expertise becomes significant by the formation of special organs for the fight against criminality. Within the battle against criminality under increasingly complex conditions, the number of activities for which expertise was necessary in addition to life experience and general culture. It can be observed, that what is needed for an efficient prosecution today is *top professional equipment and the application of scientific achievements*. Because of that, the education of those persons that participate in the fight against crime is of key importance and should be devoted the highest possible attention. By nowadays, the quantity of criminalistic knowledge has been multiplied so much that probably there is no expert that knows all tools and methods of criminalistics. The great quantity of knowledge necessarily directs towards specialization. The higher the level of knowledge, methods and means of certain field of criminalistics, the less will be the number of fields covered by the knowledge of one person. The development inevitably points to narrow specialization. The future perspective is the understanding of minimal number of fields of criminalistics: one. Therefore, one man will be able to commend with knowledge on a satisfactory level only in one field of criminalistics (e.g. ballistics). In many areas even narrower specialization will be needed.

2.7. *Privatization*

Many factors lead to the emergence of private sector in certain areas of criminalistics. It is mainly in the field of proactive, pre-delict activity (surveillance, guarding objects and persons, and like). However, private specialists in

some areas of criminalistics also exist (e.g. ballistics). Their products, higher-level security, expert opinion, are in fact a specific good on a specific market.¹² In the developed countries a market of security has been formed. Its participants are the wealthy, which need and demand higher level of safety than those offered by the state organs, and they are willing to pay high sums for the satisfaction of their needs. On the other side there is the “private sector of security” that offers its services.

Almost all the developed countries have realized that they need help in fighting the increasing and rough crimes. Private subjects act as some sort of “extended hand of the state”, dealing with the task of the protection of citizens (for a certain reward), as an activity of a general interest that used to be a state monopoly. It depends on the estimation of the state, which portion of its market it will hand over to the private sector. Thereby, there is even a potential competition between private and public sectors, which can eventually only advance criminalistics.

3. Concluding remarks

Criminalistics plays a significant role in the battle against crime. Because of that, the battle depends a lot on the direction of future development of criminalistics. It follows that the question of tendency in the development of criminalistics is not only a scientific and theoretical question, but it is of significant social and practical importance. The strong and fast socio-economic developments in the second half of the 20th century and at the beginning of this century had their reflection in criminality and in social demands in relation to the fight against it. Unfavourable tendencies can be noticed regarding criminality. The increase in the number of executed criminal acts is a global phenomenon, a number of new, more dangerous forms emerge, the elements of violence, also organization and internationalization are more emphasized, the number of children as perpetrators is increasing, etc. An efficient fight against crime is a priority social need. A society that intends to fight against modern criminality *efficiently* has to provide the organs of prosecution with contemporary means. Without that they are helpless and could not be expected to produce any spectacular results. Because of that, the tools and methods of criminalistics based on contemporary scientific achievements should not be rejected due to potential abuses¹³ and potential danger for human rights. They have to find their place in criminal procedure with necessary limitations regarding the protection of human

¹² More on this: Feješ (2002), Položaj policije u pravnoj državi-problem kontrole policije

¹³ Like that Krivokapić (2001)

rights and the corresponding provisions on the prevention of abuse. Also, in this sense a balance has to be found between the interests of criminal prosecution and the protection of rights and freedoms of citizens. For the efficient fight against criminality, or at least the formation of a stable and solid balance in the area of battle against criminality, that will be in accordance with the requirements of a lawful state, a scientific background is necessary, where criminalistics will have a key role within the field of law that deals with criminality. Criminalistics has to build (autonomously or taking over and adjusting other scientific fields) contemporary methods and tools for that fight. Within that system, modern technology is just one but a very important factor. The adequate contemporary education of experts is also of a fundamental importance.

On the other hand, ethical and legal opinions evolve on criminality and on the fight against it. Human rights are insisted on, and the creation of international standards for their protection. The criminalistics of the 21st century has to be in compliance with these requirements. The tendencies of development that we elaborated shows that criminalistics will be capable of satisfying and will remain one of the main actors in the fight against criminality.

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TENDENCIJE RAZVOJA KRIMINALISTIKE U 21 VEKU

Rezime

U uvodnom delu rada autor se osvrće na dinamizam kao bitnu karakteristiku, koja se ispoljava i u procesu nastanka tako i daljem razvoju kriminalistike.

Pisac u drugom delu rada, sažeto u 7 tačaka, izlaže tendencije razvoja kriminalistike na početku XXI veka.

U zaključnim razmatranjima pisac ističe da je za efikasnost otkrivanje i dokazivanje krivičnih dela u pravnoj državi neophodna naučna baza koju pruža kriminalistika. Autor se zalaže i za mnogo brže uključivanje novih naučnih dostignuća u dokazna sredstva krivičnog procesnog štrava uz neophodna odgovarajuća ograničenja radi očuvanja osnovnih prava i sloboda građana i sprečavanje zloupotreba.

Summary

In the introductory part of the paper the author points onto dynamism as an important characteristic visible both in the process of emergence and in the development of criminalistics.

In the second part of the paper, the author concisely, in seven points, shows the development of criminalistics at the beginning of the 21st century.

In the concluding remarks the author emphasizes that for the efficient discovery and evidence of criminal acts in a lawful state a scientific basis given by criminalistics is necessary. The author also advocates the much faster inclusion of new scientific achievements among the evidence of criminal procedure with necessary limitations for the preservation of basic rights and freedoms of citizens and prevention of abuses.

THE APPLICATION OF METHODS OF PHYSICS IN SOCIAL PROCESSES

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Abstract: The paper represents an attempt to establish an analogy between gas molecule absorption and social processes. Reallocation of electoral votes is estimated on the basis of analogy of the electoral process and absorption of gases. According to the analysis conducted here, one could say that this idea has a good perspective.

Key words: irreversible absorption, reversible absorption, electoral votes

1. Introduction

This paper represents an attempt to establish an analogy between gas molecule absorption and social processes such as investigation and legal proceedings. A similar attempt was made in the Paper (Lj.Mašković, S.Jaćimovski, B.Popović, 2006.), where the analogy with electric current in $R - L$ and $L - C$ circuits was used instead of irreversible and reversible absorption. It is well-known that there are two types of absorption: irreversible and reversible. With irreversible absorption, the absorbed molecules do not return to the environment they left, while in case of reversible absorption they can return several times.

In the course of investigation and legal proceedings, evidence points, which measure the degree of suspicion or guilt, can reliably determine guilt or innocence. Such reliable points are obtained by means of forensic expertise. Evidence points can also be unreliable, e.g. statements of witnesses (it is well-known that sometimes witnesses change their statements several times).

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2. Irreversible and reversible absorption

When it comes to absorption of gas molecules by an absorbent, recombination effects had been ignored for a long time. It was believed that the process of absorption developed in one direction, i.e. the possibility of return of molecules from the absorbent to the original environment was not considered. Such type of absorption, which particularly occurs in cases where the absorbed molecules engage in a chemical reaction and combine with absorbent molecules, is called irreversible absorption. Since molecules bring along their energy, irreversible absorption is accompanied with irreversible absorption of heat energy. The pressure depends on the number of molecules; therefore, irreversible absorption of molecules may lead to irreversible change of pressure. On the basis of empirical facts, the law of irreversible absorption is formulated in the following manner: the change in the number of molecules with time is proportionate to the current number of molecules.

$$\frac{dn}{dt} = -Pn \quad (2.1)$$

P is called irreversible absorption frequency, while n is the number of not-yet-absorbed molecules. By solving (2.1), for the initial condition $n(0) = n_0$, the following is obtained:

$$n(t) = n_0 e^{-Pt} \quad (2.2)$$

It should be noted that equations analogous to the equation (2.1) are obtained both for the change of temperature with time and for the change of pressure with time. In addition, the calculated changes in the number of molecules, and changes of temperature and pressure are read compared to certain reference values (Avogadro's number, temperature equal to 0°C, atmospheric pressure, etc).

It was observed for the first time in thermodynamic research (M.G.Gulić, 1973) that temperature did not decrease exponentially over time in case of irreversible absorption. The author of the quoted paper included periodic functions in temperature formulation, since temperature with time had quasi-periodic property. In Paper (U.Timotić, 1990) quasi-periodicity was attributed to irreversible absorption processes. Reversible absorption means that a number of molecules absorbed by the absorbent leave the absorbent and return to the environment they left. After some time, these molecules go to the absorbent again and the process is periodically repeated. Paper (U.Timotić, 1990) formulates the law of reversible absorption: the change in the number of molecules with time is proportionate to the time mean value of n absorbed molecules:

$$\frac{dn}{dt} = -A \frac{1}{t} \int_0^t n(t) dt \quad (2.3)$$

As it can be seen, the reversible absorption is based on the idea of cumulative-ness of absorption, i.e. the idea that absorption depends on the sum of all absorbed molecules over time. The coefficient A is called reversible absorption frequency. In order to obtain n , (2.3) relation should be differentiated by time. The following is obtained:

$$\frac{d^2n}{dt^2} = -\frac{An}{t} - A \frac{1}{t} \int_0^t n(t)dt \quad (2.4)$$

(2.3) yields:

$$A \frac{1}{t} \int_0^t n(t)dt = -\frac{dn}{dt} \quad (2.5)$$

When this is plugged in (2.4), the second-order differential equation is obtained:

$$\frac{d^2n}{dt^2} + \frac{1}{t} \frac{dn}{dt} + \frac{A}{t} n = 0 \quad (2.6)$$

The solution to this equation is zero-index Bessel function:

$$n(t) = J_0(\sqrt{4At}) \quad (2.7)$$

For $t = 0$, Bessel function equals one, has infinite number of zeros the distance of which is approximately π and decreases over time according to $J_0 \approx t^{-1/2}$ rule.

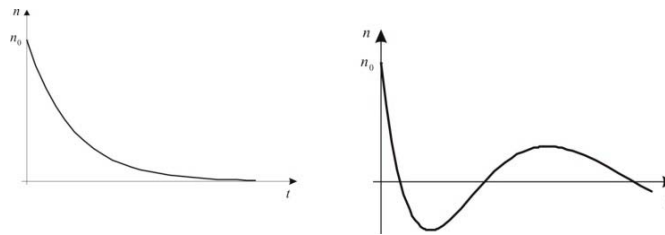


Figure 2.1: Diagram of irreversible absorption (left) and reversible absorption (right)

As it can be seen, the solution has quasi-periodic property. The derived formula for irreversible absorption has been experimentally tested in Paper (S.Rackov, 1990), where carbon-dioxide overpressures were measured in a vessel containing water. After some time (about two hours), overpressure turned into under pressure, after which it started approaching barometric pressure. This corresponds to the described behaviour of Bessel function. It should be noted that with the reversible absorption as well the quantities of temperature, pressure and number of particles should be read starting from certain reference val-

ues. Micro theory of reversible absorption A frequency, based on the calculation of probability of gas absorption tunneling is given in (U.Timotic, 1991).

3. Calculation of the number of gas molecules in case of absorption

In general case, in a vessel containing gas and absorbent both irreversible and reversible absorption processes take place. If the absorbent is a highly volatile substance, then absorption can take place in both directions: gas-absorbent and absorbent-gas. Markov graph corresponds to such situation.

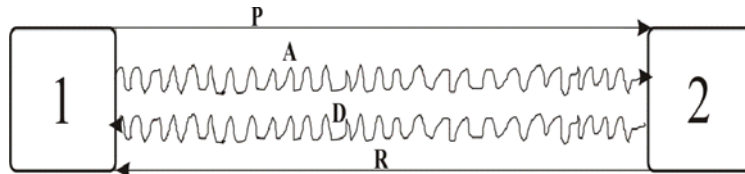


Figure 3.1: Markov graph for reversible and irreversible processes

Cell 1 of the graph represents a part of the vessel containing gas. Cell 2 represents absorbent. Straight lines represent irreversible absorption processes, while sinusoidal lines stand for reversible absorption processes. The direction of absorption is marked with an arrow. If the number of molecules in Cell 1 is $n_1(t)$, the number of molecules in Cell 2 is $n_2(t)$, and the number of molecules is constant and totals n_0 , then the following relation is valid:

$$n_1(t) + n_2(t) = n_0 = \text{const} \quad (3.1)$$

$$\frac{dn_1}{dt} = -Pn_1 - \frac{A}{t} \int_0^t n_1 dt + Rn_2 + \frac{D}{t} \int_0^t n_2 dt \quad (3.2)$$

$$\frac{dn_2}{dt} = Pn_1 + \frac{A}{t} \int_0^t n_1 dt - Rn_2 - \frac{D}{t} \int_0^t n_2 dt \quad (3.3)$$

$$n_1(0) = n_0 \quad n_2(0) = n_0 \quad (3.4)$$

The system is solved in the following manner: in (3.1) n_2 is expressed through n_1 and n_0 and differentiated:

$$\frac{d^2 n_1}{dt^2} + \left(P + R + \frac{1}{t}\right) \frac{dn_1}{dt} + \frac{A + D + P + R}{t} n_1 = \frac{(R + D)n_0}{t} \quad (3.5)$$

A general solution to this equation is given as (R.Maksimović, 1993)

$$n_1(t) = \frac{A+P}{A+D+P+R} n_0 e^{-(P+R)t} K_\lambda[(P+R)t] + \frac{A+P}{A+D+P+R} n_0 \quad (3.6)$$

where $K_\lambda[(P+R)t]$ is Kumar's function (G.Korn and T.Korn,1961) given as

$$K_\lambda[(P+R)t] = \Gamma(\lambda+1) \sum_{\nu=0}^{\infty} \frac{(-1)^\nu}{(\nu!)^2 \Gamma(\lambda-\nu+1)} [(P+R)t]^\nu \quad (3.7)$$

($\Gamma(x)$ is the so-called Euler's gamma function). First terms of Kumar's function are given as

$$K_0(\theta) = 1; K_1(\theta) = 1 - \theta; K_2(\theta) = \frac{1}{2}\theta - 2\theta + 1$$

Solutions to the system of equations (3.2) - (3.3) are given as

$$W_1(t) = \frac{n_1(t)}{n_0} = \frac{R+D}{A+D+P+R} \left\{ 1 + \frac{A+P}{R+D} e^{-(P+R)t} K_\lambda[(P+R)t] \right\} \quad (3.8)$$

$$W_2(t) = \frac{n_2(t)}{n_0} = \frac{A+P}{A+D+P+R} \left\{ 1 - e^{-(P+R)t} K_\lambda[(P+R)t] \right\} \quad (3.9)$$

The function $W_1(t)$ has the horizontal asymptote

$$\lim_{t \rightarrow \infty} W_1(t) = \frac{R+D}{A+D+P+R} \quad (3.10)$$

while the function $W_2(t)$ has the horizontal asymptote

$$\lim_{t \rightarrow \infty} W_2(t) = \frac{A+P}{A+D+P+R} \quad (3.11)$$

In the domain of finite times, W_1 and W_2 can cut their horizontal asymptotes, while x-coordinates are obtained from the following equation:

$$K_\lambda[(P+R)t] = 0 \quad (3.12)$$

As it can be seen from the formulas (3.8) and (3.9), relative numbers W_1 and W_2 and their behaviour with time significantly depend on Kumar's functions.

4. Stationary problem

Previous analyses have shown that the number of particles n_1 and n_2 have horizontal asymptotes. It means that in case of big t values, i.e. sufficiently long times having passed, the numbers n_1 and n_2 hardly change with time. That is the reason why analyses of this kind use stationary approximation, which is useful for big time values:

$$\begin{aligned}\frac{dn_1}{dt} &\approx 0; t \gg 1 \\ \frac{dn_2}{dt} &\approx 0; t \gg 1\end{aligned}\tag{4.1}$$

If we use approximation (4.1) in the system of equations (3.2) and (3.3), which means that $n_1 \approx \text{const}$ and $n_2 \approx \text{const}$, we get the following system of equations:

$$\begin{aligned}-(P + A)n_1 + (R + D)n_2 &= 0 \\ (P + A)n_1 - (R + D)n_2 &= 0\end{aligned}\tag{4.2}$$

The obtained equations are identical, just one of them should be solved by means of the equation $n_1 + n_2 = n_0$. It means that in case of a stationary problem we get a system of equations:

$$\begin{aligned}(P + A)n_1 - (R + D)n_2 &= 0 \\ n_1 + n_2 &= n_0\end{aligned}\tag{4.3}$$

It follows that

$$n_1 = \frac{(R + D)n_0}{P + A + R + D}\tag{4.4}$$

$$n_2 = \frac{(P + A)n_0}{P + A + R + D}\tag{4.5}$$

As it could have been assumed, the solutions to the stationary problem are horizontal asymptotes of the functions $n_1(t)$ and $n_2(t)$.

5. Forecast outcome of voting on the basis of the experimental group

In the early work (Maksimović, 1993) the analogy between gas molecules and evidence points was used, which can lead to investigation. Secure evidence corresponds to irreversible processes of absorption of gas molecules, while the uncertain indications compared with the gas molecules that are reversibly absorbed.

It is completely obvious that the analogy between gas molecules and indications can be transmitted in the domain choice. Surely votes for candidates who match the molecules absorb irreversible, while the votes of those who chose not definitive corresponding molecules of gas which reversibly absorb.

You will be presented the mathematical formalism of this analogy and using it will show on the way which may predict the outcome of the vote with great probability, if the choice is to be made between two candidates.

There are a certain number of votes within the electorate which is definitely committed to one candidate.

Second, a number of voters will surely vote for the other candidate. Based on these facts, it is appropriate to introduce the maximum number definitive oriented voters, but such that half of that number belongs to one and the other half to another candidate. This number will be marked with N_0 the analogy to represent the number of molecules in a closed court, which creates atmospheric pressure. If the total electorate has N votes, where $N > N_0$ the difference:

$$N - N_0 = n_0 \quad (5.1)$$

can be compared to a surplus of molecules in a court that creates overpressure. It is obvious that variation in n_0 number of votes resolves the outcome of the vote.

If you are with the $n_A(t)$ mark the number of votes a candidate A gets, and the $n_B(t)$ the number of votes for candidate B , it can be taken to:

$$n_A(t) + n_B(t) = n_0 \quad (5.2)$$

Change the number to the $n_A(t)$ and $n_B(t)$ in time to a symbolic Markof graph:

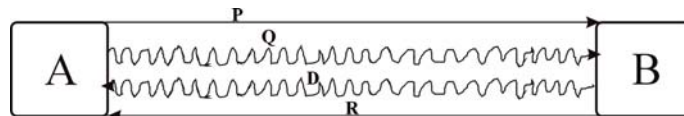


Figure 5.1: Markof graph for electorate case

which corresponds to the system integer-differential one act:

$$\frac{dn_A}{dt} = -Pn_A - \frac{Q}{t} \int_0^t n_A dt + Rn_B + \frac{D}{t} \int_0^t n_B dt \quad (5.3)$$

$$\frac{dn_B}{dt} = Pn_A + \frac{Q}{t} \int_0^t n_A dt - Rn_B - \frac{D}{t} \int_0^t n_B dt \quad (5.4)$$

Initial conditions for this case are:

$$n_A(0) = n_{0A} \quad n_B(0) = n_{0B} \quad n_{0A} + n_{0B} = n_0 \quad (5.5)$$

The full line indicates the macroscopic graph cost with P and R corresponding to irreversible voice, and wavy lines indicate prices with Q and D corresponding to reversible (insecure voice).

The system is one act of (5.3) while (5.4) is reduced to hiper-geometric de-generated differential equation and system solutions to $n_A(t)$ and $n_B(t)$ are expressed through Kumar's functions. Solving process is complicated, and will seek a solution in common for these cases, in stationary approximation.

5.1. Probabilities of choice in stationary approximation

Based on the analysis of paragraph 1 and paragraph 2, it is known that solutive systems act (5.3) and (5.4) have a horizontal asymptote. Stationary approximation consists of the fact that a function of time at $n_A(t)$ and $n_B(t)$ replaces the constant value of its asymptote (3.10)-(3.11). Based on this it can be taken that:

$$\frac{dn_A}{dt} = \frac{dn_B}{dt} \approx 0; \int_0^t n_A dt \approx tn_A; \int_0^t n_B dt \approx tn_B \quad (5.6)$$

Based on (5.6) both make (5.3) and (5.4) are reduced to $(P + Q)n_A = (R + D)n_B$, whence follows

$$\frac{n_A}{n_B} = \frac{R + D}{P + Q} \quad (5.7)$$

A probabilistic choice candidate or candidate B are indicated with W_A and W_B and are given the by following terms:

$$W_A = \frac{n_A}{n_0}; W_B = \frac{n_B}{n_0} \quad (5.8)$$

Because $n_A + n_B = n_0$ from (5.8) it follows that:

$$W_A + W_B = 1 \quad (5.9)$$

Equality (5.9) can be written as:

$$\frac{W_A}{W_B} = \frac{R + D}{P + Q} \quad (5.10)$$

The system of equations (5.9) and (5.10) is easily solved and solutions are:

$$W_A = \frac{(R + D)}{P + Q + R + D} \quad (5.11)$$

$$W_B = \frac{(P + Q)}{P + Q + R + D} \quad (5.12)$$

As you can see the probability of choice W_A and W_B depends exclusively on the absorptive coefficients P , Q , R and D . These coefficients can determine or accurately estimate based on the successive test sample, which represents a particular group of voters.

*5.2. Determination coefficient and irreversible movement
of reversible votes*

Select the group of G of which half voters were told to vote for candidate A , and other half will vote for candidate B . This group of voters test the M times in equal intervals. The testing can happen to reduce the number of votes for candidate A and that the reduction in the number of votes for candidate B equals zero. Tests with this score are taken into account when determining the size of P , Q , R and D because the line P (on graph) is in charge of movement of one-directedness of votes. The same goes for reducing the number of votes for candidate B : the calculation includes only those tests where the reduction in votes for a candidate is equal with zero. This is held one-way line R (on graph). It is clear that they can be different from zero and reduce the number of voters for candidate A and reducing the number of voters for candidate B , but these test results do not take into account, because they do not maintain one-way line P or R . If a group of voters is greater, the greater number of test results for coefficients P , Q , R and D will be reliable. It is realistic to assume that the experimental group has about 1000 voters, and that the current tests at least at the moment are 10. If time t_K , states that the number of voters for candidate A decreased value Δ_A compared to the previous test, then the number of voters for candidate B increases for value $\tilde{\Delta}_B$, while not necessarily $\tilde{\Delta}_B = \Delta_A$ as Δ_A part of the voters decide for the candidate B , and the other part remains undefined. If the M_A finds moments of time reducing the number of voters for candidate A , then the remaining $M - M_A$ moments of time, states can increase the number of voters for candidate A , and reducing the number of voters for candidates B . Increasing the number of voters for candidate A , will be marked $\tilde{\Delta}_A$, while reducing the number of voters for candidate B , will be marked with Δ_B .

Coefficient reversible process determined so as to reduce the total number Δ_K of shares of tests, where it appears and multiplies the frequency reduction factor, where T is the total time of the tests and it is usually 3 to 6 months. On the basis of this it is:

$$P = \frac{\sum_{K=1}^{M_A} \Delta_{KA}}{M_A} \frac{G}{T} \quad (5.13)$$

$$R = \frac{\sum_{K=1}^{M-M_A} \Delta_{KB}}{M - M_A} \frac{G}{T} \quad (5.14)$$

For coefficients reversible process by definition these regulations, the reduction and increasing the number of votes must be taken into account. Therefore, the reversible coefficients Q and D , determined as the sum of absolute value, increase minimize the sum of the decrease, which divides the actual number of tests M and multiplies the frequency factor

$$Q = \frac{\left| \sum_{K=1}^{M-M_A} \tilde{\Delta}_{KA} - \sum_{K=1}^{M_A} \Delta_{KA} \right|}{M} \frac{G}{T} \tag{5.15}$$

$$D = \frac{\left| \sum_{K=1}^M \tilde{\Delta}_{KB} - \sum_{K=1}^{M-M_A} \Delta_{KB} \right|}{M} \frac{G}{T} \tag{5.16}$$

The obtained formulae (5.13), (5.14) (5.15) and (5.16), are fundamental to predicting the outcome of elections.

5.3. Illustrative example

The sample of 1000 voters tested 10 times in equal intervals. Time analysis of the experimental group was 4 months and followed

$$T = 86400 \cdot 120 = 10308000s; \frac{G}{T} = 9.645 \cdot 10^{-5} \text{ Hz}$$

number of tests	A	undecided	B	undecided
0	500		500	
1	$\Delta_{1A}=5$	2	$\tilde{\Delta}_{1B}=3$	
2	$\Delta_{1A}=4$	3	$\tilde{\Delta}_{1B}=1$	
3	$\tilde{\Delta}_{1A}=6$		$\Delta_{1B}=10$	4
4	$\Delta_{1A}=2$		$\tilde{\Delta}_{1B}=2$	
5	$\tilde{\Delta}_{1A}=4$		$\Delta_{1B}=5$	1
6	$\Delta_{1A}=6$	3	$\tilde{\Delta}_{1B}=3$	
7	$\tilde{\Delta}_{1A}=2$		$\Delta_{1B}=4$	2
8	$\Delta_{1A}=10$	3	$\tilde{\Delta}_{1B}=7$	
9	$\tilde{\Delta}_{1A}=4$		$\Delta_{1B}=4$	
10	$\Delta_{1A}=2$		$\tilde{\Delta}_{1B}=2$	

Based on the formulae (5.13)-(5.16) we can calculate:

$$P = \frac{5+4+2+6+10+2}{6} \cdot 9.645 \cdot 10^{-5} = 4.66 \cdot 10^{-4} \text{ Hz} \quad (5.17)$$

$$R = \frac{10+5+4+4}{4} \cdot 9.645 \cdot 10^{-5} = 5.55 \cdot 10^{-4} \text{ Hz} \quad (5.18)$$

$$Q = \frac{|6+4+2+4-(5+4+2+6+10+2)|}{10} \cdot 9.645 \cdot 10^{-5} = 1.25 \cdot 10^{-4} \text{ Hz} \quad (5.19)$$

$$D = \frac{|3+1+2+3+7+2-(10+5+4+4)|}{10} \cdot 9.645 \cdot 10^{-5} = 9.645 \cdot 10^{-4} \text{ Hz} \quad (5.20)$$

When the (5.17) - (5.20) replaced in (5.11) and (5.12) for the choice probability it is obtained:

$$W_A = \frac{6.4145}{12.405} = 0.525$$

$$W_B = \frac{5.91}{12.405} = 0.475 \quad (5.21)$$

which means that we should expect a close election victory of candidate *A*.

6. Conclusion

This paper describes the processes of reversible and irreversible absorption of gas molecules. It should be noted that the irreversible absorption of long-introduced in the gas and the thermodynamic theory. As reversible absorption, its recent research and initiated the fact that quasi-periodic behavior of temperature and pressure could not explain over the irreversible absorption. The description of absorption of gas molecules exposed in paragraph 1 and in paragraph 3, reallocation of electoral votes is estimated on the basis of analogy of the electoral process and absorption of gases. Firmly committed voters have a flow of votes as the molecules that are irreversibly absorbed, while the undecided voter votes are analogous molecules that are reversibly absorbed.

This is one of the first attempts to use physical laws to social problems. According to the analysis conducted here, one could say that this idea has a good perspective.

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PRIMENA METODA FIZIKE U DRUŠTVENIM PROCESIMA

Rezime

Ranijih godina je bilo pokušaja da se prenesu ideje i metodi iz jedne oblasti delatnosti u drugu, radi boljeg razumevanja kompleksnih fenomena i procesa što je doprinelo usavršavanju i jedne i druge delatnosti. Posebno je matematičko modelovanje prodrlo u ne samo u druge oblasti nauke, veći i gotovo u sve oblasti života i rada. Teško je zamisliti savremenu nauku i savremeni život bez široke primene matematičkog modeliranja. Zamena proučavanog projekta njegovim likom - matematičkim modelom i njegovom analizom i proučavanjem je suština metodologije matematičkog modelovanja. Takođe, treba istaći postojeće tendencije da se društvena kretanja analiziraju, a njihova kretanja predviđaju, na bazi standardnih stohastičkih fizičkih zakonitosti uz primenu teorije fluktuacija. Ove analogije su nesumnjivo korisne i mogu da ubrzaju razvoj drugih nauka, ali naravno, uz jedno ograničenje: treba tačno utvrditi do koje se granice mogu i smeju koristiti analogije: svako prekoračenje ovih granica moglo bi da dovede do krupnih zabluda (H. Haken, 1977). U radu su opisani procesi ireverzibilne i reverzibilne apsorpcije gasnih molekula. Treba napomenuti da je ireverzibilna apsorpcija davno uvedena u gasne i termodinamičke teorije. Što se tiče reverzibilnih apsorpcija, njena istraživanja su novijeg datuma i inicirana su činjenicom da se kvaziperiodično ponašanje temperature i pritiska nije moglo objasniti preko ireverzibilne apsorpcije.

U slučaju izbornog procesa kada imamo samo dva kandidata preraspodela izbornih glasova procenjena je na osnovu analogije izbornog postupka i apsorpcije gasova. Čvrsto opredeljeni glasači imaju tok glasova kao molekuli koji se ireverzibilno apsorbuju, dok su neopredeljeni glasovi glasača analog molekulima koji se reverzibilno apsorbuju. Ovo je jedan od prvih pokušaja da se fizičke zakonitosti koriste u socijalnim problemima. Prema analizama koje su ovde izvršene, moglo bi se reći da ova ideja ima dobru perspektivu.

Summary

In recent years, an effort has been present to transfer ideas and methods from one area of science to another in order to understand complex phenomena and processes as well as to develop both areas. In particular, mathematical modelling is present in almost all spheres of human activity. The substitution of the subject of study with its image – a mathematical model – and its study is the essence of the mathematical modelling methodology. The research of the model instead of the subject (phenomenon or process) gives a possibility to examine the behaviour of the subject itself without any effort, quickly and cost-effectively, and, as a rule, in all situations imaginable. There have been attempts to analyze social phenomena and predict their development on the basis of standard stochastic physical laws with the application of the theory of fluctuations. The application of analogies is, without doubt, useful and may foster the development of other sciences, with a limitation, of course: it should be determined precisely to what limit analogies may and should be used: each stepping over these limits could lead to major misconceptions (H. Haken, 1977).

The description of absorption of gas molecules exposed in paragraph 1 and paragraph 3, reallocation of electoral votes is estimated on the basis of analogy of the electoral process and absorption of gases. Firmly committed voters have a flow of votes as the molecules that are irreversibly absorbed, while the undecided voter votes analogous molecules that are reversibly absorbed.

This is one of the first attempts to use physical laws to social problems. According to the analysis conducted here, one could say that this idea has a good perspective.

TERRORIST ACT AS CRISIS SITUATION – CHALLENGE FOR INVESTIGATORS

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Abstract: Terrorism presents a greater threat to national and transnational security today than it has presented at any time in history. Authors outline the most important issues regarding investigating contemporary terrorism. They argue that smart organization of investigation process in crisis situations caused by terrorism is critical for the effective implementation of investigation plan. The plan reflects all the elements of the case, defines investigation team and serves as a guide for resources use (human, technical, information). If we observe the investigation as a process, a case does not end by solving crisis because managers must bear in mind the long-term aspects of everything carried out during the investigation. An adequate organization enables investigation to be analyzed in objective way with minimizing possibilities for errors. It is important that managers value the ideas based on their content and not the origin and the effect it has on the team.

Key word: organization of investigation process, crisis situations, terrorism.

1. Introduction – Investigating contemporary terrorism

Terrorism presents a greater threat to national and transnational security today than it has presented at any time in history. Better technology, communications, weapons, and modes of transportation are at terrorists' disposal. Many terrorism cases will be proven in court through forensic evidence, so it is important

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that extensive crime scene investigations be conducted. The types of terrorism include left- and right-wing extremism, religious, single-issue, and cyber terrorism. Every investigative technique used to solve criminal cases can be used with terrorist investigations. Terrorists are unlikely to cooperate with authorities after being arrested. They study law enforcement operations and alert colleagues on investigation techniques. The interview is the most common investigative technique that an officer will use. Straightforward questions or devious tactics can both be used to gather information during the interview. Terrorists are usually reluctant to submit to interviews with law enforcement officers. Record checks are usually the easiest investigative technique available to an investigator. Surveillance is a valuable investigative tool because it involves actual observations that are useful in affidavits and obtaining arrest warrants. Informants who can provide the most valuable information are likely to be from the inside. Investigators often overlook someone on the periphery to a conspiracy but they can provide tips and leads. Trash cover is an investigative technique that involves law enforcement recovery of discarded materials. A pretext telephone call is a covert investigative technique in which the caller tries to elicit information without telling the recipient that the call is associated with police. Physical evidence plays an important role in most criminal cases and plays an even more significant role in terrorism cases as it can be used to develop a case without an expert examination. A crime scene is terribly important, as evidence obtained from a crime scene is difficult for a subject to dispute in court. An investigative task force helps track terrorists as they move about the country. Undercover operations may mean a one-time contact or it could mean frequent contacts, but concerns include whether the agency will be able to provide support and whether the undercover agent will be recognized. Microphones or wire taps, closed-circuit television, and tracking devices are some examples of surveillance equipment. An investigative review is useful in long cases when someone reviews the entire case and can spot weaknesses. Underground terrorists appear to live a normal life but have false identities; they will abandon friends and families who do not share their views and they usually have a support network (Dyson, 2001).

After a short review of the concept of terrorism and its most important features that each terrorist act turns into crisis situation, we will point out some questions in connection with investigation process of terrorist acts.

2. Terrorist acts as crisis situation

Nowadays term "*terrorism*" is broadly used in many fields and represents the object of interest and research of different experts from different disciplines. However, beside the fact that science and academia deal with phenomenon of terrorism

more intensively today, the terrorism is still at the lists of unsolved problems to which many conferences have been dedicated.

Despite its broad use, or partially due to its broad use, a precise and comprehensive definition of this term has not yet been given. Thus, the term is often used for much different occurrences, and to make things worse, the character of the very terrorism has changed throughout history. While a violent activity was called terrorism in one period, in some other periods it was called war, liberation war or crime. It has also gained elements of media spectacle. Terrorism penetrates into our homes from TV screens,¹ we are bombarded from papers and magazines and sometimes it enters our lives in a much more direct way. For the first time, it is possible to see direct footages of atrocities on TV and thus, unfortunately the terrorism has a chance to “move” into our homes.

Reasons are many but we would still list three problems we find most common with regards to resisting to uniform definition of the term terrorism: the first one is the tautological way of terrorisms defining,² the other is multiform of terrorism³ and the third, the key problem, is different interests of political nature.⁴

When identifying terrorism behavior, some definitions of terrorism also use other criteria to precise the elements of the said offense. One of the criteria pertains to the instruments used to perpetrate the act of terrorism. From the onset of formulating terrorism, the instruments used included explosives, instruments for fire starting, etc. These instruments are common for terrorist behavior promotion even nowadays.

¹ „Probably every American remembers what he/she did that morning, on Tuesday, September 11, 2001. Everything changed when people saw on TVs in their houses, offices and shops the images of terror ongoing in New York, Washington and Pennsylvania.“ Jonathan, 2004: 350.

² Many definitions of terrorism introduced the term *«terror»(English)*, *«terreur»(French)*. In that sense, the definitions represent tautology. Most authors dealing with the issue involve tautology in the proposed definition of terrorism in their discourses and papers. Tautological definition of terrorism is also found in the most of international documents such as Paragraph 1 of Second Geneva Convention on Prevention and Punishment of Terrorism (1937). Korajlić, 2008:385.

³ The other problem of uniform definition of term terrorism is the multiform of the terrorism. Terrorists' behaviors are various, from actions against freedom and physical integrity (mostly kidnapping and hostage situations) to assassinations of prominent governmental figures, other politically active persons, diplomatic staff, businessmen and experts or even ordinary people. The said terrorist acts are committed using various instruments and means; explosives, fire-arms or some other types of arms or traps. Terrorist behavior against public welfare means demolition using explosives of constructions, shopping malls, banks, etc. Korajlić, 2008:386.

⁴ Problems of defining terrorism of political nature is the most difficult one when trying to have one notion that would be widely accepted (Jakovljević, 1997). Many efforts to come to a uniform definition of terrorism are often burdened by problems of political nature. Practice shows that most terrorist acts were committed for achieving political goals. In that regard, *Sottill* said: «Truly, as of while ago it has been noted that the terrorism had become a political instrument, whether national or international », while Professor *V. Dimitrijević noticed the same*: «We should first recognize that the terrorism is an instrument of political fighting... that terror has political goal». Korajlić, 2008:386.

Although the term "*crisis*" is probably one of the most used terms in everyday speech, there is no clear and uniform definition of its notion, but instead there are many and often opposing interpretations of the term. Not going into details of difficulty to define the term crisis, and for the purpose of this paper, we will take the contemporary definition of crisis by *Pol t'Hart* who finds that the crisis is "serious threat to fundamental structures or values and norms of social system which, under time pressure and very unstable circumstances, requires critical decision making." (Rosenthal, Charles & 't Hart, 1989: 10)

It is obvious that every terrorist act is also a crisis. Terrorist act targets are always of high social value (people's lives, health or property, key infrastructure, facilities of great symbolic importance for a community) since the goal of terrorists is to attract high publicity. In order to succeed, they must attack targets of the most importance for a society. Terrorist act is, in its nature, such a state of play which requires an urgent decision making from police and security forces, and often from policy makers. Any delay of coming to a decision may result in large scale loss of human lives and property, panic, fear and terror. However, circumstances under which decisions must be made are often very unclear. How many terrorists there are, how many hostages, what firearms they have, what they are ready to do, who their accomplices are, what the scope of their action is, if the terrorist act is finished or it is just one of many to follow – these are just a few of open and unclear questions. Finally, other elements of crisis that are being ever-present - can affect every organization (non profit, governmental agency, religious community, multinational organization etc.), turning point in the development of a situation, risk for goals and values, situation with ambivalent outcome, affecting large number of stake holders,⁵ unexpected (not planned), resulting in important consequences for future and increases stress and changes relations between members of organization – are present in a terrorist act. Therefore, there is no doubt that an act of terrorism is also a crisis situation *par excellence*, i.e. an abnormal crisis (Mitroff, Alpaslan, 2003) which is the result of malicious actions of people and as such represents the specific managerial challenge.

3. Combating terrorism – crisis management at test

After demolition of World Trade Center in New York and Pentagon building in Washington on September 11, 2001, and everyday threats by *Al-Quaida*, a new era has begun both in terrorist and antiterrorist tactics. Having in mind

⁵ Term "*stakeholders*" refers to all individuals and groups (interested parties) interested in the function of an organization.

the aforementioned events, especially the act of terrorism on the soil of the USA - September 11, 2001, we can say that it forced all countries, even the countries of former Yugoslavia to put extra efforts to adopt needed and efficient laws, to create atmosphere and establish police and other state bodies in order to combat terrorism as efficient as possible.

Beside strategic and normative level, successful combating of terrorism implies changes on both tactical and operational level. Namely, if a community as a whole, but also certain organizations and entities within, do not perceive terrorism through *proactive philosophy*, it can result in destabilization of a democratic society. Since a terrorist act is a special type of crisis situation, it is necessary to use principles and logic that applies to crisis management. So, it is necessary to *“learn how to make difference so that the crisis does not emerge and not only how to respond to it”*. Proactive manager should continuously make risk assessments even before extraordinary situation occurs, review alternatives and consequences of different actions and make anticipations in order to gain a maximum control over extraordinary situations, which, in case of their occurrence, would have less detrimental consequences because of the proactive actions.

A question arises as to how this philosophy is being applied to terrorist incidents? Proactive measures during terrorist incidents are efficient in disarming of terrorists since undertaking them makes terrorists feel that officers and managers protecting a facility have a control over situation. Increased security measures on a location that is a possible target are considered to be a proactive step. Also, planning and training before an act of terrorism is a proactive behavior. Proactive philosophy establishes efficient systems in order to decrease number of possibilities for perpetration of different types of criminal offenses and chances that terrorists will succeed. Proactive philosophy and proactive actions are methods used by agencies to impact situation development and not just respond to it. Therefore, it is the task of the management of those agencies which deal with security issues to adopt proactive philosophy in their strategies and plans.

4. Finding out and the first reaction

One of very important prerequisites for task execution by police is timely collection of information about the preparation and execution of a terrorist act. Authorized officials (police) undertake very intensive activities, such as criminalistic control, patrol activities, numerous operational and tactical measures and actions: blockade, ambush, observation, raid, surveillance, use of informants, etc., and undertake organized, planned and thought through actions and focus on occurrences and behavior of interest for case solving.

It is of outmost importance to establish appropriate relationship between police (authorized officials) and citizens. It would be a mistake if the police would focus on criminal offenses and events with obvious consequences, which are expressed in acts of terrorism. Therefore, they must pay attention to broader community. By thoughtful, tactical and courteous behavior toward citizens, the relationships can be built that enables the flow of information. Citizens see their own interest in cooperation with police - they can help build more efficient system for crime suppression and improve general safety.

It is a known fact that terrorists often infiltrate in a community for various reasons. Their purposes range from selecting targets to collecting information about certain locations or facilities and functioning as sleeping cell in order to obtain materials for identification of staff and financial support; all for the purpose of preparing for the attack. Previous terrorist acts clearly demonstrated that terrorists rent houses within communities. They find jobs in local companies and try to "fit in" so that they would avoid any suspicion.⁶ There is a set of indicators that can point to potential terrorists:

- A new person (or family) moves in the neighborhood and is very low key;
- Children never go to school or socialize with other children;
- A new neighbor receiving many packages (terrorists often receive training or equipment by suspicious deliveries) or unusual packages;
- A new person moves in and tries too hard to socialize with everyone;
- A new neighbor poses too many questions;
- A new person who never goes to work;
- A new neighbor having suspicious people coming in and out of his apartment;
- A new neighbor prone to lying about marriage, family, job etc.;
- A foreigner lingers around certain place (terrorists must covertly observe possible targets and gather information);
- A new person in neighborhood takes photos of unusual places;
- A new person moves in with few items and personal property etc.

A question arises as to the ability of citizens to detect such kind of behavior and their readiness to report it to police. Law enforcement agencies often en-

⁶ Example of Al-Quaida: The best example of this tactic can be found in the Al-Quaida training manual - "do-it-yourself" guide for terrorists. Manual guides terrorist how to kill. It tells them how to infiltrate in the communities, while plotting and waiting for directions to kill innocent civilians. Terrorists use the benefits of free societies even when committed to their destruction. Al-Quaida manual teaches terrorists how to deceive. It teaches them how to anticipate questions by the government, and how to lie about who they are, what they do and who they know. They are also told to travel with families in order to be less noticeable.

courage citizens to report suspicious “terrorist” activities through different campaigns - prevention activities with messages “if you see any suspicious terrorist activities, please call this number or contact police.” Problem stems from the combination of two things: first, citizens are not properly trained and educated to know what to look for and second, they get alarmed too fast and their fear from crime in general and terrorism is being increased.⁷

A very important segment pertaining to being timely informed about acts of terrorism is the interagency cooperation at all levels. Lack of the cooperation can be an obstacle for successful crises resolution caused by terrorist attack. Such shortcomings can be hardly remedied when the terrorist act takes place. Trust should be nurtured in the daily work.

5. Organization of investigation process

Organization of investigation process in crisis caused by terrorism requires due attention, attention to details and skills of an investigator. Scenes encountered cause various problems that are not common for most of criminal investigations. In most criminal investigations, once a criminal offense is perpetrated and official persons (police) informed thereof, a crime scene can be secured and kept under relatively same conditions as found. It is, however, mostly not the case with terrorist attacks investigations. By the time an investigator reaches a crime scene, it is very likely that many persons have already been there, including firefighters, other agencies and services, pedestrians, owners of facilities and their clients, etc., so the crime scene has been contaminated. Preserving crime scene is frequently the last thing to worry about when arriving at the scene for the first time, first and foremost because of the fact that the absolute priority is assisting the victims of the attack.⁸ Despite the difficulties that accompany investigations of such cases, diligent, thorough and systematic investigation may yield much useful information. However, an issue of criminal intent represents another huge difference between the investigation of a terrorist attack and other investigations. In most of other investigations, an investigator usually knows that a crime has been committed just by arriving at the scene. In

⁷ Warnings that the level of risk of potential terrorist attack in the region is high and that new attacks can be expected are frequent. When nothing happens and when this scenario becomes repetitive, it can damage the trust and credibility of police agencies. The result is that people become careless and finally start ignoring those warnings. The Police Executive’s Role in Combating, Last Modified: 08/07/05, Proactive Concepts in Transnational Terrorism Combating Terrorism, Module 9: Page 2-4.

⁸ For more details see Korajlić N., 2009., Crime method in detecting, solving and proving explosions, Center for Security Studies/ *Kriminalistička metodika otkrivanja, razjašnjavanja i dokazivanja eksplozija*, Centar za sigurnosne studije, Sarajevo, p. 57.

cases of crisis caused by terrorism, it is not always clear at the scene if an explosion, for example, was accidental or caused. Establishing this very important fact may require extensive and long-term investigation.

However, law enforcement agencies from around the world keep facing with constant, ever changing challenges in terrorism combating. As a result, law enforcement agencies were forced to redirect inadequate resources and seek information about terrorists and terrorist activities by using various methods from various sources. Many strategies often used in combating terrorism are the same across law enforcement agencies. They include efforts such as forming of special task forces, improving regional intelligence centers and providing expensive extra security to vital infrastructure and potential location known as soft targets. Subsequently, these efforts can often drain valuable resources such as budgets, equipment and staff. Too often the terrorists are capable to attack vulnerable targets at different locations with different success rate because of the fact that the resources are at the limited, specific locations. ⁹

If a perpetrator is not caught immediately, then the analysis of state of play, political analysis, the analysis of items and traces at the scene and gathered information about victims and other relevant facts point to alternatives about possible whereabouts of perpetrators. At the same time, basic questions that need answers are posed and they determine operational and tactical measures and actions needed to indentify, detect and capture a perpetrator, identify his/her accomplices, ties and process them.

It is not possible to decide beforehand on all operational and tactical measures and actions and their sequence, whether to be undertaken individually or combined, since this issue is case driven. Therefore we will only point to the most frequent operational and tactical measures and actions that yielded good results. They include: urgent informing of neighboring and border law enforcement agencies to execute adequate control and similar; increased traffic control, control of vehicles, passengers and luggage; increased patrol activities; increased surveillance of actual and potential perpetrators; covert surveillance of certain people, facilities and locations; organizing chase, blockade, ambush, etc., with adequate methods of operational work and operational and technical instruments.

A plan starts at the crime scene. Perpetrator is unknown, but the known fact is where the crime was committed and evidence is there. It is possible to tell from the crime scene when the criminal offense was perpetrated, possible motive, modus operandi of the perpetrators and perhaps how many perpetrators were involved.

⁹ The Police Executive's Role in Combating, Last Modified: 08/07/05, „Proactive Concepts“ In: *Transnational Terrorism Combating Terrorism*, Module 9: Pages 1-2.

The first step is the analysis of crime from basic perspective, i.e. establishing the type of crime. It is also very important to convey all information to team members involved in the case, including information about which pieces of evidence are needed to prove the crime. Answers to these questions will help in further phases of crime investigation and processing of elements of the crime. A motive may be terrorism or some other cause (greed), but the very crime can also be a result of many types of law violation. It includes violence, fraud, drugs and other crimes.¹⁰

Many investigators often assume that carefully planned crime, such as an act of terrorism, is impossible or very difficult to solve since perpetrators rarely make mistakes. It is wrong to believe this, since mistakes are always made and we should look for them. In that sense, we should focus on neighborhood in which the crime was perpetrated and on cooperation with citizens. A perpetrator maybe did not make a mistake in preparation phase, but he/she surely made a mistake during the execution or after it. Many circumstantial facts in that phase can point to a right direction. Several careless statements of involved, careless spending habits, revisiting crime scene – these are just some of potential vulnerable points. Identifying errors requires creative investigator and managers should encourage creative work.¹¹ Also, the logic according to which the quality of someone's proposal is directly linked to his/her rank must be abandoned.

6. Concluding remarks

Law enforcement agencies must make better use of citizens as resources in proactive approach to terrorism combating. The cooperation, which implies a high level of trust on one side and high level of citizens' responsibilities on the other side, means true partnership and shared responsibility. It cannot only come down to police requesting citizens to report suspicious activities. They must be trained and educated what to pay attention to, then what to do next and what not to do, etc.

A danger from transnational terrorism and other types of organized crime in former Yugoslavia cannot be resolved in a simple way and short time. It is necessary for law enforcement agencies to develop and implement comprehensive plan that includes rising awareness and culture of safety. Hence, certain topics should be included in training and education of citizens. For example:

¹⁰ An investigation may be proactive or reactive. Investigations of groups involved in crime, serial crime, corruption, fraud and other are proactive by nature. Bomb attacks, bank robbery and homicides are types of crime that require reaction. Sometimes investigation can be a combination of reactive and proactive as when a terrorist group, under proactive investigation, robs a bank to fund its operation.

¹¹ Develop the Investigative Plan and Handout, 2005, Elements of a Major Case Investigation, Lesson 3-1, Sample Major Case Response Plan.

- To include education on antiterrorist activity as a mandatory course in public schools;
- To incorporate education on antiterrorist activity as a mandatory course in secondary schools and universities;
- To organize random seminars on antiterrorist activity for public companies, state bodies, key infrastructures, civil and religious organizations and communities;
- To inform the public in appropriate manner about certain safety related information and indicators through media and creative campaigns.

Efficient investigation combined with efficient management must lead to success. Serious cases require more than a solution; they imply effort of the management which includes more than investigation focus. By identifying and focusing on key elements of cases, managers can contribute to the whole process of case management. Plans should be flexible since planners cannot anticipate every event that may affect the case, and the investigation results must be monitored from the onset which will allow for plan management or change of plan. It is important to have a system within a plan which enables direct information transfer and a system which enables review of investigation report.

In the investigations of serious cases such as terrorism, certain participants in the investigation come and go after performing their part of work. However, it is of outmost importance that a participant leaving conveys information collected before leaving. Open communication is thus important among all participants and for managers to receive the right information to be exchanged with all other members of the investigation team.

Serious cases bring many changes, so a new organization must be able to manage change and ready to accept the consequences of changes. New organization is established for the sake of efficiency of many participants, so the carefully set chain of command will help in accepting change and enable team members to know whom to report to. Correctly established organization contributes to willingness of participants to exchange ideas. It is important that managers measure ideas by their contents and not the rank of the originator. New organization should be flexible and able to adapt.

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TERORISTIČKI AKT KAO KRIZNA SITUACIJA-IZAZOV ZA ISTRAŽITELJE

Rezime

Terorizam predstavlja veliku pretnju nacionalnoj i međunarodnoj bezbednosti danas više nego ikada u dosadašnjoj istoriji. Autori navode najznačajnije probleme vezane za istraživanje savremenog terorizma. Oni smatraju da je dobra organizacija kritična za efikasnu primenu plana istrage. Plan odražava elemente slučaja, ustanovljava tim potreban za rad na slučaju, te služi kao vodič za primenu resursa (ljudskih, tehničkih, informacionih). Kada istragu posmatramo kao proces, slučaj ne završava razrešenjem krize, jer menadžeri moraju imati na umu dugoročne aspekte svega što je učinjeno za vreme istrage, a adekvatna organizacija dozvoljava da sprovođenje istrage bude analizirano na objektivan način, uz smanjenje mogućnosti za greške. Važno je da menadžeri mere vrednost ideje po sadržaju, a ne poreklu, jer je dobar deo vrednosti neke ideje zasnovan na tome kakav učinak ima na misiju tima.

Summary

Terrorism presents a greater threat to national and transnational security today than it has presented at any time in history. Authors outline the most important issues regarding investigating contemporary terrorism. They argue that smart organization of investigation process in crisis situations caused by terrorism is critical for the effective implementation of investigation plan. The plan reflects all the elements of the case, defines investigation team and serves as a guide for resources use (human, technical, information). If we observe the investigation as a process, a case does not end by solving crisis because managers must bear in mind the long-term aspects of everything carried out during the investigation. An adequate organization enables investigation to be analyzed in objective way with minimizing possibilities for errors. It is important that managers value the ideas based on their content and not the origin and the effect it has on the team.

THE EXPERTISE AS A MEAN OF EVIDENCE

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Abstract: The Draft version of the new Macedonian Code of Criminal Procedure (N-CCP), in the group of means of evidence, besides the defendant's statement, the witness and the on-site inspection and reconstruction, provides also the expertise. This mean of evidence shall be ordered when it is necessary to provide a finding and an opinion from a person who has the necessary professional knowledge in order to determine or assess some important fact, if it can help for assessing the evidence or for determination of the legally relevant facts.

Regulating several aspects of expertise, among which its ordering, duties and exemption of the expert witness, procedures, minutes, different types of expertise, etc., in 21 articles of N-CCP, points out the serious attempt for its entirely legal defining.

Key words: expertise, mean of evidence, criminal procedure

1. Introduction

The provisions regulating the expertise, as one of four means of evidence provided in the Draft version of the new Macedonian Code of Criminal Procedure (N-CCP),¹ are stated in Part One “General provisions”, specifically in

¹ N-CCP's first draft version dated December 26, 2008, was published in electronic form on the website of the Ministry of Justice (MoJ) (<http://www.pravda.gov.mk>), and in printed form in: *Македонска ревија за казнено право и криминологија*. (2009) год. 16, бр. 1. Скопје. p. 374-572.

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Chapter XVIII “Means of evidence” of Section G “Process measures and actions for securing persons and evidence” (Articles 243-263). On the other hand, in the existing Code of Criminal Procedure (M-CCP), it is classified in the investigatory actions,² i.e. in Part Two “Course of procedure”, A. Pre-trial procedure, Chapter XVIII “Investigatory actions”, 7. Expertise (Articles 254-274).³ It is a mean of evidence that is ordered to determine or assess some important fact, when it is necessary to provide a finding and an opinion from a person who has the necessary professional knowledge, if it can help for assessing the evidence or for determination of the legally relevant facts. However, the MoJ’s working group that drafts N-CCP during the meetings held after publishing its first version “reduced” the last part of the said Article 243 para 1,⁴ and returned to the existing M-CCP’s Article 254.

The term “expertise” (*peritia*, *expertisis*) is differently defined in the process theory. For some theorists it is a process mean, for others - an evidence action, for the third - a legally regulated procedure in which the expert gives a statement, and for the fourth - it needs to be defined in a narrow and in a broad sense. In a narrow sense it is an action of the expert regarding research of the materials and giving an opinion, while in a broader sense includes, in addition to these, the actions that the body of criminal procedure undertakes referring the expert’s statement in the proc-

The other means of evidence are: the statement of the defendant, the witnesses and the on-site inspection and reconstruction.

² Code of Criminal Procedure (“Службен весник на Република Македонија” бр. 15/2005 - consolidated text, 83/2008, 67/2009). The group of investigating actions, besides the expertise, also includes: search of a home and persons, temporary security and seizure of objects or property, handling suspicious objects, examination of a defendant and hearing of a witness.

³ By analyzing the criminal procedure provisions of other laws, it can be observed that the expertise usually is defined as a mean of evidence or an evidence action, for example in:

- Code of Criminal Procedure of the Republic of Serbia - S-CCP (“Службени гласник Републике Србије” бр. 46/2006, 49/2007): Part I “General provisions”, Chapter VII “Evidence action”, 6. Expertise, Articles 126-144,

- Code of Criminal Procedure of Bosnia and Herzegovina - B-CCP (“Службени гласник Босне и Херцеговине” бр. 3/2003, 32/2003, 36/2003, 26/2004, 63/2004, 13/2005, 48/2005, 46/2006, 76/2006, 29/2007, 32/2007, 53/2007): Part one “General provisions”, Chapter VIII “Actions of evidence”, Section 7 “Expertise”, Articles 95-115,

- Code of Criminal Procedure of the Republic of Croatia - C-CCP (“Народне новине Републике Хрватске” бр. 152/2008): Second Part “Regular procedure”, A. Pre-trial procedure, Chapter XVIII “Evidence action”, 8. Expertise, Articles 308-328,

- Code of Criminal Procedure of the Republic of Italy - I-CCP (Codice di procedura penale “Gazzetta ufficiale della Repubblica Italiana” n. 250 del 24 ottobre 1988): First part, Third book “Evidences”, Title II “Means of evidence”, Chapter VI “Expertise”, Articles 220-233. The review of the I-CCP’s amendments, see: Pavišić, B. - redakcija (2002). *Talijanski kazneni postupak*. Rijeka: Pravni fakultet Sveučilišta, p. 321-326.

⁴ It refers to the part “if it can help for assessing the evidence or for determination of the legally relevant facts”, which for there exists an example in B-CCP’s Article 95.

ess.⁵ While N-CCP and M-CCP do not define the term “expert”, attempts are being made by the Draft version of the Law on the Activities of Expertise (LAE)⁶ - an expertise is producing a professional findings and opinions by a person who has the necessary professional knowledge and has a license to perform the expertise, based on the application of scientific and professional methods, technical achievements, knowledge, acknowledgement and experience in the field where the expertise is done.⁷ Taking into account the meaning of expertise in the criminal procedure, as well as the overall reform of the Macedonian judicial system, MoJ plans LAE to be adopted in the period from June to September 2009.⁸

2. Appointing (determination) and exempting an expert

The expertise is *determined* by a written Court order,⁹ upon a reasoned proposal by the parties or ex officio. In this order it should be stated which facts

⁵ Quoted by: Милошевић, М. (1996). *Сврхна лица у кривичном процесу*. Београд: Полицијска академија. p. 64-65. According to: Матовски, Н. (2003). *Казнено процесно право: ојшић дел*. Скопје. p. 306, the expertise is process action with which the experts, on the basis of special professional preparation, knowledge and skills, note the facts and present their opinion about them, and Lukić, Т. (2008). *Медицинско вештачење и процесном законодавству*. Београд: Удружење правника Србије. *Pravni život - časopis za pravnu teoriju i praksu: tematski broj “Pravo i međunarodne integracije, 21 godina Копачићке школе природног права”*. br. 10. том II. p. 69, quotes the definition given by Vasiljević, Т. and Grubač, М.: “The expertise is an observation of the facts relevant to the procedure or giving opinion about the observed facts (or both), through persons not interested in the procedure, based on their professional knowledge or skills, in those cases where general knowledge of the judge and his professional legal qualification is not sufficient.” See also: Вујовић, Д., Вучковић, Ј. (1996). *Кривично процесно право*. Београд. p. 152-154; Марина, П., Матовски, Н. (1972). *Кривична процесна права - књига прва*. Скопје. p. 212-222; Матовски, Н., Лажетик-Бужаровска, Г., Калајџићев, Г. (2009). *Казнено процесно право*. Скопје. p. 222-235.

⁶ LAE’s transitional and final provisions (Article 39) stipulate that from the day of the enforcement of this law, the Law on Establishment and Operation of the Republican Institute for Judicial Expertise in the Field of Finance, Financial Operations and Traffic - LEORIJE (“Службен весник на Социјалистичка Република Македонија” бр. 7/1977) is no longer valid.

⁷ LAE under the term “activities of expertise” means “performing expertise in judicial, administrative and arbitration procedure, in the procedure of mediation and in other cases specified by law.”

⁸ LAE aims to edit the conditions and manners of conducting the activities of expertise; types of expertise; the subjects who will conduct the activities of expertise; conditions and procedure for obtaining and revoking the license to perform activities of expertise; competence, organization and operation of the Bureau for Judicial Expertise (BJE), as well as other issues related to the expertise.

More on the reform of the Macedonian judicial system, see: “*Стратегија за реформа на казненото право*”; “*Стратегија за ионајтамошно свроведување на реформата на правосудниот систем*”. “*Акциски план на Нацрт Стратегијата за ионајтамошно свроведување на реформата на правосудниот систем*”. All three documents are published on the MoJ’s website (<http://www.pravda.gov.mk>).

⁹ While drafting the N-CCP, there was a dilemma who is to determine the expertise - the Court or the body conducting the procedure. In the MoJ’s working group first dominated the position that it should be in the Court jurisdiction, but later this position changed, and unlike the first version now it is in the jurisdiction of “the body conducting the procedure”. However, in the text of the first draft version at one place “a Court” is mentioned, at another place “a body conducting

shall be subject to expertise and to whom it shall be entrusted. Although the Court is independent in deciding whom to entrust the expertise, N-CCP stipulates a limit - if for a certain type of expertise a special professional institution exists, or if the expertise may be produced within a state body, such expertises, and especially the more complicated ones, shall as a rule be entrusted to such institution/body.¹⁰ The same as M-CCP, N-CCP establishes a rule that for simple expertise one expert shall be appointed, but if the expertise is more complex, then two or more experts shall be appointed. Article 243 of the N-CCP, on the other hand, provides two novelties referring to the determination of an expertise, namely:

If for a certain type of expertise there are clearly appointed experts with the Court, other experts may be appointed only if there is a danger of postpon-

the procedure”, and at the third “a body before which the procedure is being conducted”, therefore the demand for terminological harmonization of the text of the Law.

Compare with B-CCP’s Article 96 para 1, according to which a written order for expertise is issued by the Public Prosecutor or the Court.

¹⁰ The same: M-CCP’s Article 256.

The institution/body determines one or more experts who will conduct the expertise.

It can be noticed that N-CCP does not undertake Article 255 of the M-CCP, according to which the Court appoints the experts from the existing lists of experts, thereby taking into account the professionalism, the experience in a certain field, technical equipment, the reputation in the profession and other circumstances which are of importance for providing objective expert finding and opinion. [The aforementioned list of experts, which is composed on the basis of a public invitation, is publicly published and is re-evaluated every two years. I assume that disclamation of M-CCP’s Article 255 is caused by the fact that the activities of expertise will be regulated in more details by LAE. Thus, LAE in the Article 6 defines the conditions which a person who performs expertise must meet (has passed the professional exam, a license has been issued to him/her and he/she is registered in the Register of Experts), while the subjects who can conduct the expertise classifies into groups: state administration body, higher education institutions, research institutes and chemical laboratories on the basis of authorizations established by the law and if they have at least two employees with a license; company for expertise, registered under the Law on Trade Companies for conducting actions of expertise and has at least two employees with a license, and trader-individual, registered under the Law on Trade Companies that meets the requirements for expertise determined by LAE.

With the exception, that the expertise can be conducted by persons who have a scientific degree PhD/Master of Science in the adequate field, as well as persons who have post-secondary or secondary education in the field of handicraft (furriers, watchmakers, openers, goldsmiths, opticians and other artisans). Conditions that the listed persons have to fulfill are given in LAE’s Article 7.

Chapter II of LAE is dedicated to BJE - state administration body as a legal person which performs professional duties in the field of expertise and super-expertise for the Macedonian judicial authorities, state administration bodies, legal entities and natural persons.

The Former Republican Institute for Judicial Expertise in the Field of Finance, Financial Operations and Traffic (Institute) was established as a Republican organization that conducts: expertise, especially in complex cases, in the field of finance and financial operations, as well as road, railway, water, air and cable railway traffic, for the Courts and for the Yugoslav People’s Army (JPA); expertise in the field in which conducts expertise for the Courts and for the JPA; and super-expertise in the field in which conducts expertise for the Courts and the JPA, in cases where the expertise was conducted by other expert (Article 2). The other activities that fall within the scope of the Institute are listed in Article 3 of LEORIJJE.

ing or if the permanent experts are impeded or if other circumstances require so (para 5), and

- As an expert may be appointed a person living abroad or a foreign professional institutions, but only as an exception - when it is evidently justified by the nature of the expertise, and especially in a lack of a sufficient number of domestic experts or professional institutions for a specific type of expertise, i.e. if other especially important circumstances require so (para 6).¹¹

Upon a previously acquired opinion of the expert, the body ordering the expertise determines the deadline for the expertise to be conducted, which may be extended only on the basis of an expert's reasoned request.

Comparing N-CCP to M-CCP in the provisions for exemption of an expert, it can be noted that no changes have been made, except for some minor technical corrections. Hence, a person who belongs to one of the following groups cannot be appointed as an expert:

- The first group: a person who cannot be examined as a witness, a person released from the duty to testify, and a person against whom a criminal offense was done, and if taken, a Court decision cannot be based on his/hers finding and opinion,
- The second group: a person who works together with the defendant or the damaged party in the same body or other legal entity, as well as a person who is employed with the damaged party or the defendant, and
- The third group: a person who has been examined as a witness.¹²

3. Duties of the expert

Duty of an expertise, provided in N-CCP's Article 244 para 1, includes two obligations: first, a person asked to act as an expert must respond to the summon, and second, to give his/hers finding and opinion, also the provision is specified that the finding and opinion should be given within the deadline determined in the order, which may be extended for justified reasons.¹³ Further,

¹¹ Both paragraphs are taken from S-CCP, more specifically, from Article 127 paras 4 and 5. In this context, see also para 6 of the same article.

Similar in LAE's Article 8 entitled "Foreign expert".

¹² The exemption procedure is regulated in Chapter III "Jurisdiction of the Courts and exemption". Namely, according to Article 43 para 1 of N-CCP, the provisions for the exemption of a judge or lay judge shall accordingly be applied to the experts, if nothing else has been defined for them (Article 245), with a note that about their exception the judge of the Pre-trial procedure, the Trial Chamber, the Presiding judge of the Trial Chamber or the judge decides.

¹³ The same: Article 128 para 1 of the S-CCP. It seems that there is a repetition between Article 243 para 7 and Article 244 para 1 of the N-CCP regarding the opportunity for extension of the deadline in which the expertise should be conducted.

the expert is obliged to submit a report containing the following elements: the evidence examined; the tests performed; the finding and the opinion to which he/she has reached and all other relevant information as he/she deems necessary for a fair and objective analysis, and of course – a detailed explanation how he/she reached to a certain opinion.¹⁴ For an expert who does not fulfill his/hers duties, the appropriate sanctions will follow:

- If he/she is dully summoned, but does not appear, and does not justify his/hers absence, or if he/she refuses to provide an expertise or does not act within the deadline determined in the order – he/she may be fined with a pecuniary fine,¹⁵
- If unjustifiably absent - he/she may also be brought in forcibly.

4. Expertise procedure

Expertise can be taken during the entire procedure, starting from the Pre-trial procedure, to the procedure on legal remedies, with a note that regardless in which phase it is taken - *the expertise procedure* is always the same. Thus, N-CCP specifies that the body ordering the expertise handles its conducting. Before the process of providing an expertise begins, the expert shall be asked to carefully review the expertise's object, to precisely state everything he/she shall note and find, and to explain his/hers opinion impartially and in accordance with the rules of science or skills, and also shall be warned that giving a false statement constitutes a criminal offense.¹⁶ N-CCP in this segment defines two more issues: first, when providing his/hers finding and opinion, the expert shall take into account the evidence which have been pointed to him/her by the Police, the Public Prosecutor or the Court, and second, the expert may testify only regarding the facts derived from his/her immediate finding, unless if

¹⁴ The same: B-CCP's Article 97.

¹⁵ The decision ordering a pecuniary fine can be appealed, on which decides the Trial Chamber from N-CCP's Article 30 para 5. Otherwise, MoJ's working group proposed the pecuniary fine for the expert to be from 100 to 1000 Euros, and for the professional institution from 500 to 3000 Euros. Compare with: M-CCP's Article 75 para 1, Article 257 para 2.

¹⁶ Macedonian Criminal Code - M-CC ("Службен на Република Македонија" бр. 37/1996, 80/1999, 4/2002, 43/2003, 19/2004, 60/2006, 73/2006, 7/2008, 139/2008) in the Article 367 provides a criminal offense "giving a false statement", for its committing in the criminal procedure the expert will be punished with imprisonment from three months to five years (para 3), and if as a result of its committing a particularly serious consequences have occurred for the defendant, then the expert will be punished with imprisonment from one to ten years (Article 4). However, M-CC leaves the possibility for the expert to be released from the punishment if he/she voluntarily revokes his/hers false statement before making a legally binding decision (Article 5). See: Камбовски, В. (2003). *Казнено право - посебен дел (четврто, дојолнейо издание)*. Скопје. Skorje. p. 540-545.

in the course of preparing his/hers finding and opinion he/she did not use the information that other experts from the same field may justifiably take into account.¹⁷

Before the beginning of expertise, the expert may be asked to take an *oath*. The expert may take an oath before the main hearing only if there is danger that he/she shall be unable to attend the hearing, and the reason for taking the oath will be stated in the minutes. If the expert is permanently appointed and already sworn, then before the expertise he/she shall only be warned of the taken oath.¹⁸ Therefore, not by chance, as *leading principles* which the experts are required to abide during the expertise, are stipulated: legality, professionalism, honesty, impartiality, independence, economy, responsibility, diligence, efficiency.¹⁹

The process of providing an expertise is handled by the body conducting the procedure, and this means that the body shows the objects to be reviewed to the expert, asks him/her questions and if necessary shall ask for an explanation in respect to the given finding and opinion. On the other hand, the expert may ask for clarifications, permission to review the case-file documents, and may propose an evidence, objects and information to be gathered which are impor-

¹⁷ The same: B-CCP's Article 99 paras 1 and 2.

¹⁸ The manner in which the oath is taken is defined in Article 418 para 2 of the N-CCP. Before being examined on the main hearing, the expert takes an oath that reads: "I swear on my honor that I have conducted the expertise advisedly and according to the rules of my profession and that everything I declare in that respect is true." The technical error can be immediately noticed, i.e. instead of "advisedly", it should stand "conscientiously". The oath in M-CCP reads: "I swear on my honor that I shall perform the expertise conscientiously and according to my best knowledge and that I shall present my finding and opinion correctly and fully" (Article 344 para 4), while the oath that a person gives to the Minister of Justice on the day of obtaining the license according to the LAE reads: "I undertake and I promise on my honor that I shall perform the expertise conscientiously, impartially, in accordance with the rules of science and professional knowledge and I shall deliver my findings and opinions correctly, timely and fully" (Article 14). The text of the oath in S-CCP reads: "I swear on my personal and professional honor that I shall give conscientious and impartial expertise, according to my best knowledge and that I shall fully and correctly present my finding and opinion" (Article 130 para 4), in B-CCP: "I swear to my honor - I declare that I will speak the truth and I will correctly and fully present my finding and opinion" (Article 270 para 4), in H-CCP: "I promise that the entrusted expertise I shall perform conscientiously and according to my best knowledge, the finding and opinion I will present correctly, fully and objectively, in accordance with the rules of the profession" (Article 312 para 2), in I-CCP: "Conscious of the moral and legal responsibility which I undertake in conducting the task, I will try to conduct my duties without any other goal except to seek the truth and to maintain a secret of all expertise actions" (Article 226 para 1)...

¹⁹ Besides defining the principles in Article 3, LAE in the Article 20 determines what is considered as "incompetent, negligent and untimely actions of the expert", i.e. "expertise that is not performed in accordance with the rules of science and the profession within the prescribed or specified deadline". While, according to LEORIJE's Article 4 during the performance of tasks of the expertise and super-expertise, the Institute provides the application of verified methods and knowledge in accordance with the achievements of science and experiences in the practice within an adequate field.

tant for providing a finding and an opinion. If he/she is present at on-site inspection, reconstruction or other investigatory action, may propose certain circumstances to be clarified or that the person examined is asked certain questions.

Unless the expertise requires lengthy examinations or if the examinations are performed in a professional institution/state body or out of ethical reasons, the expert as a rule shall review the objects of the expertise in the presence of the body conducting the procedure and of the minute-maker. If a certain substance needs to be analyzed, then the expert shall be given only a part of that substance at his/her disposal, and the rest shall be secured in the quantity necessary for possible additional analysis.

The expert is obliged immediately to record the finding and the opinion in the *minutes*, but also may be approved for additional submission of a *written finding* or *opinion* within a deadline determined by the body before which the procedure is being conducted. The minutes, or the written finding and opinion, shall contain the following data: the expert who conducted the expertise, and his/her occupation, professional education and specialty. N-CCP supplements M-CCP's Article 261 para 2 that beside the parties, also the defendant's counsel who had not attended the expertise shall be notified that the expertise procedure has been completed, and that they may review the minutes or the written finding and opinion.²⁰

Through comparison of the Article 250 of N-CCP and the Article 262 of M-CCP, which refer to the *expertise in a professional institution or a state body*, it can be perceived that there is no difference between them. Thus, the body conducting the procedure shall warn the professional institution/state body that a person from Article 245 or a person for whom the reasons for the exemption from an expertise envisaged by N-CCP exist may not participate in providing a finding and an opinion, as well as of the consequences of giving a false finding and opinion.²¹ For the parties an opportunity is provided to ask the senior official of the institution/body to acknowledge the names of the experts that shall conduct the expertise. When the expertise is completed, the institution/body submits a written finding and opinion signed by the persons that conducted the expertise, and the body conducting the procedure may ask for explanations from the institution/body in respect of the finding and the opinion given.

²⁰ The same: S-CCP's Article 134 para 2.

²¹ Afterwards, the professional institution/state body shall be given a material at their disposal needed for the expertise, and if necessary it shall be preceded according to the N-CCP's Article 246 para 5.

5. Disposal of the inadequacies of the expertise and additional expertise

The same as M-CCP, N-CCP provides a possibility for *disposal of the inadequacies of the expertise* and for *additional expertise*. The first situation exists when the data of the experts on their finding and opinion differ significantly, or if their finding and opinion is unclear, incomplete or contradictory in itself or with the examined circumstances and these deficiencies cannot be corrected with a hearing of the same experts, then the expertise shall be repeated by the same experts.²² The second situation exists when the finding or opinion contains deficiencies or contradictions or if a reasonable doubt appears regarding the accuracy of the finding and opinion given, and such deficiencies or doubts cannot be corrected with a repeated hearing of the experts, then a new expertise shall be performed, but this time - with other experts.²³

6. Technical advisers

Technical advisers are novelty introduced by the N-CCP, which may be appointed by the Public Prosecutor, the defendant and his/her counsel from the list of registered Court experts, in order to assist them in collecting the data or for evaluation, i.e. for contesting the expertise.²⁴ Technical advisers may take several actions, such as: to attend the assigning of the tasks to the experts and may put requests and objections to the Court regarding the expertise which are recorded in the minutes; at a request of the parties to participate in expert's actions, whereas they may propose a specific research to the expert, as well as to provide remarks which shall be entered in the report; and if they were appointed

²² When these deficiencies exist in the finding (the opinion is not mentioned), the M-CCP prescribes that the expertise shall be renovated (but not repeated) with the same or other experts (Article 264).

²³ The second situation, which in the M-CCP applies only to the opinion (and not to the finding), prescribes that the opinion of other experts shall be required (Article 265), while the N-CCP's Article 252 provides that completely new expertise shall be performed. The same: S-CCP's Article 135. In this direction, LAE in the Article 2 p. 3 defines the term "super-expertise" as "professional and critical expertise to the expertise performed by another expert, prepared from at least three experts". Compare with the previously mentioned Article 2 of the LEORIJE.

²⁴ The number of the technical advisers may not exceed two. If it is a defense for poor persons, then the defendant and his/hers counsel are entitled to assistance of a technical advisor borne by the Budget of the Republic of Macedonia. The N-CCP provides a prohibition according to which as a technical advisor may not be appointed a person who cannot be an expert.

During the meetings of the MoJ's working group, held after the publication of the N-CCP's first draft version, Article 253 was supplemented by one more paragraph (para 4), under which the expert's rights and obligations are adequately applied to the technical advisers, who are defined as experts from the Register of Judicial Experts, that parties engage during the procedure when they require an expert assistance in a particular field.

after completing the expertise, then they may examine the minutes and may ask the Court for authorization to examine the person, object or the venue subject of the expertise.²⁵

7. Types of expertise

The remaining nine provisions of the N-CCP (Articles 255-263) devoted to the expertise as a mean of evidence refer to its various types, namely: examination and post-mortem of a corpse;²⁶ examination and post-mortem of a fetus or a newborn; toxicological examination; providing an expertise on bodily injuries; psychiatric expertise; physical examination, drawing blood and other medical matters,²⁷ and providing an expertise on business books.²⁸

²⁵ The idea for the technical advisers is taken from the I-CCP. See: Article 225 (appointing a technical advisor), Article 230 (actions of the technical advisors), Article 233 (technical consultation outside of the cases of expertise) of the I-CCP.

²⁶ The N-CCP supplements the M-CCP's provisions dedicated to the *examination and post-mortem of a corpse*, by which when being performed, and particularly in order to determine whether the death of a certain person has been caused by a criminal offense, the body conducting the procedure might seek a professional opinion from the doctor who conducted the direct examination of the deceased person so as to determine the cause and the time of death (Article 255 para 2). When necessary, professional and scientific identification methods shall be applied - taking and comparing fingerprints from the corpse, DNA sample analysis and comparison of the obtained DNA profile with the DNA profile of the missing person or another person, blood relatives of the person believed to be possible to identify, and where necessary also performing other analysis and applying other professional and scientific methods in order to determine the identity of the corpse. The same: S-CCP Article 136 paras 2 and 4.

The Institute of Judicial Medicine and Criminology within the Medical Faculty - Skopje has sent a remark regarding the N-CCP's Article 255 para 2, that contradictions can be noticed in its contents, i.e. para 2 is not clearly defined, with a notification that the cause and time of death cannot be determined without conducting a forensic autopsy.

Regarding *the examination and post-mortem of a corpse outside of a professional institution and exemption of the doctor who treated the deceased*, there are no changes, and in the *contents of the opinion of the expert and obligations of the expert when examining and performing a post-mortem of a corpse*, the N-CCP imposes one more obligation to the expert - to pay a special attention to the biological material which is found (blood, saliva, sperm, urine etc.), to describe it and save it for biological expertise, if it is determined. The same: the B-CCP's Article 105 para 4.

²⁷ The N-CCP at the special types of expertise - *examination and post-mortem of a fetus or a newborn; toxicological examination; providing an expertise on bodily injuries; psychiatric expertise*; does not propose novelties, but at the *physical examination, drawing blood and other medical matters*, DNA analysis was introduced and it is performed on the samples that can be taken always when this is necessary for identification of a person, or for comparison with other biological traces and other DNA profiles and for this a consent is not needed from the person, nor can be considered as threat to the health. The same: the S-CCP's Article 143 para 3 (S-CCP specifies that it is a saliva sample).

The N-CCP's novelty is that the physical examination of the defendant and other matters related to it, may be performed by a Court order, and if there is danger of delaying - by a Public Prosecutor's order (the same: the B-CCP's Article 109 para 3), and if the procedure is not initiated, the taken samples may be stored for maximum five years.

8. Expertise in other N-CCP's provisions

As previously noted, the expertise can be carried out during the entire criminal procedure. Therefore, the N-CCP beside including it in the group of means of evidence, also includes it in the *investigatory actions*, together with: search, temporary security and seizure of objects or property, examination of a suspect, hearing of a witness, on-site inspection and reconstruction, and special investigating measures, which actions the Public Prosecutor may take during the investigatory procedure.²⁹ Also it should be pointed out the right of the suspect, his/her counsel and the damaged party to attend the hearing of the expert, as well the opportunity to propose to the body conducting the procedure, due to clearing the issues, to ask certain questions to the expert, and after obtaining its permission they may also ask direct questions.³⁰ Further, one of the three cases when the *evidentiary hearing* may be held, is a need for an expertise, whereas the evidence should refer to a person, object or a venue whose state is a subject to inevitable changes.³¹

In the N-CCP's Section V "Main hearing and judgment", the expert is mentioned in the preparations for the main hearing - at *summoning of a person for the main hearing* called for by the prosecutor in the indictment, i.e. by the defendant in the objection to the indictment, whereas in the summon, the expert shall be warned about the consequences of non-appearance at the main hearing.³² The parties and the damaged party may, even after the main hearing has been scheduled, ask experts to be called at the main hearing which had not been called for till then, but they must explain and indicate which of the facts are to be proven, and by which of the proposed evidence. If the Presiding judge of the Trial Chamber does not accept the motion, in accordance with the rule of non preclusion in proposing the evidence, the parties may repeat the very same motion during the main hearing.

One of the *suppositions for the maintenance of the main hearing* is the presence of the expert, which entails – if an expert is unjustifiably absent, al-

²⁸ The N-CCP supplements the *expertise on business books* - before being provided, an inventory of the business books and other business documentation in connection to these books shall be performed in the presence of the Public Prosecutor. The same: S-CCP's Article 144 para 6.

²⁹ See: The N-CCP's Article 314 para 1.

³⁰ These persons are entitled to demand their remarks regarding the performance of certain actions to be entered into the minutes and they may propose a certain evidence to be presented. See: The N-CCP's Article 321.

³¹ Regarding the other two cases when an *evidentiary hearing* may be held and how it is performed, see: The N-CCP's Articles 339-445.

³² Beside the expert, this provision also includes the technical advisor. See: The N-CCP's Article 375.

though he/she has been regularly summoned, or obviously avoids appearing at the main hearing, the Trial Chamber may order he/she to be immediately brought in forcefully. Further, the main hearing may commence in his/her absence, in which case the Trial Chamber during the main hearing shall decide whether to adjourn it or postpone it. The N-CCP also gives the Trial Chamber a possibility to punish with a pecuniary fine the regularly summoned expert who did not justify his/hers absence, as well as to order he/she to be forcibly brought at the new main hearing.³³ After the identity of the defendant has been established, the Presiding judge of the Trial Chamber shall direct the experts to the position provided for them and where they shall wait until called for the hearing. If necessary, the Presiding judge of the Trial Chamber may retain the experts so that they can follow the course of the main hearing, and may also undertake the necessary measures in order to prevent any arrangements amongst the witnesses, experts and the parties. Before *examining an expert at the main hearing*, Article 418 of the N-CCP obligates the Court to warn the expert on his/her duty to present the opinion in a clear manner and in accordance with the rules of the profession and to warn him/her that giving a false statement is a criminal offense, after which the expert takes an oath. The expert shall be examined from a position determined on the right-hand side of the Presiding judge of the Trial Chamber, turned towards the prosecutor and the defendant, but if he/she is at the territory of another state, then may be examined via telephone or videoconference.³⁴ Article 414 of the N-CCP allows three examination methods: direct - by the party that has called the expert as evidence, cross - by the opposing party, and re-direct - again by the party that has called the expert, but the questions are limited to the questions that have been asked during the examination of the opposing party.³⁵ Beside the parties, the damaged party has also the right to ask questions to the expert.³⁶ If requested by any of the parties, the written finding and the opinion shall be accepted as an evidence only if the

³³ If this is a justifiable case, then the Trial Chamber may revoke the penalty decision.

³⁴ The question is why the N-CCP did not takeover the M-CCP's Article 300 (hearing of an expert who is not able to attend the main hearing due to durable illness or other impediments, compare with the N-CCP's Article 378), Article 348 (an expert who cannot come before the Court or his/hers arrival is significantly burdened), Article 344 para 6 (the manner in which the expert orally presents his/her finding and opinion, as well as the opportunity to read his/her finding and opinion prepared in writing), as well as Article 346 (if at the previous examination, the expert has stated facts which he/she no longer remembers or if he/she deviates from his/hers statement).

³⁵ During the cross-examination and re-direct examination, the parties may be assisted by the technical advisers while asking questions. After the parties complete the examination, the Presiding judge of the Trial Chamber may ask questions to the expert.

³⁶ Thus: the N-CCP's Article 68 para 2. How does the Presiding judge of the Trial Chamber take care of the enforcement of Court rules in the process of presentation of evidence, see: the N-CCP's Article 415.

expert who has prepared the opinion has given his/hers statement at the main hearing and was cross-examined. After the examination, the expert shall remain in the courtroom, unless the Presiding judge of the Trial Chamber decides to let him/her go or to remove him/her temporarily from the courtroom. But, the Court upon the proposal by the parties or ex-officio may order the examined expert to be removed from the courtroom and called back later and examined again in the presence or absence of other experts.

The expert who is *present at the main hearing*, must respect the order and obey the orders of the Presiding judge of the Trial Chamber, otherwise the Presiding judge shall warn him/her. If the warning is ineffective, then the Presiding judge may not only remove him/her from the courtroom, but also punish him/her with a pecuniary fine. If there are grounds for suspicion that the expert *gave a false statement at the main hearing*, for this criminal offense cannot be judged immediately, but the Presiding judge may order for his/hers statement a separate report to be prepared,³⁷ which shall be delivered to the Public Prosecutor.

Regarding the *contents of the minutes of the main hearing*, according to the N-CCP's Article 404 para 3, expert's statement shall be entered into the minutes showing its essential content, with a note that this statement is entered only if it contains a differences or supplements to the previous statement.

The experts have their place in the *procedure on the legal remedies*, as well as in the *procedure of applying security measures*, the *procedure for seizure of objects and confiscation of property and property interest gained by committing a criminal offense*,³⁸ and in the *summary procedure*.³⁹ Thus, when a hearing is held before the Trial Chamber of a Second-Instance Court as a result of a *filed appeal regarding the judgment of the First-Instance Court*, to this hearing among other persons, the experts shall be summoned for which the Court shall decide that should be questioned.⁴⁰ At the *repetition of the criminal procedure*, the procedure that was completed with a legally binding judgment may be repeated in favor of the convicted person, if proven that the judgment is based on an expert's false statement.⁴¹ However, in order to use this extraordinary legal remedy, first must be proven with a legally binding judgment that the expert is found guilty of the referring criminal offense.

³⁷ These minutes should be signed by the examined expert. See: The N-CCP's Article 390.

³⁸ See provisions: The N-CCP's Article 543 paras 2 and 3; Article 548 para 1; Article 551 para 3; Article 552 para 1.

³⁹ See: The N-CCP's Article 495.

⁴⁰ Who other persons are, see: The N-CCP's Article 454 para 3.

⁴¹ More about the conditions of repetition of the criminal procedure completed with a legally binding judgment, see: The N-CCP's Article 473.

9. Conclusion

The need of introducing the European standards into the Macedonian regulations imposes a need to reform the Macedonian criminal legislation, which resulted as drafting the text of the N-CCP. Looking at the reform of procedural provisions from the aspect of an expertise, it can be concluded that it refers to the new systematization of its provisions, as well as their more precise definition.

From the above analysis of the N-CCP's text, it can be noticed that it starts from the already existing provisions of the M-CCP dedicated to the expertise, and upgrades them with positive solutions offered by the process laws of other countries - especially Serbia, Bosnia and Herzegovina, Croatia and Italy. In that manner, the N-CCP is trying this fourth additional mean of evidence, to complete in a single whole, to dispose the inadequacies and contradictions in existing regulations and practice, i.e. to propose a text which will get a European star.

10. Used abbreviations

1. B-CCP - Code of Criminal Procedure of Bosnia and Herzegovina
2. BJE - Bureau for Judicial Expertise
3. C-CCP - Code of Criminal Procedure of the Republic of Croatia
4. I-CCP - Code of Criminal Procedure of the Republic of Italy
5. Institute - Republican Institute for Judicial Expertise in the Field of Finance, Financial Operations and Traffic
6. LAE - Draft version of the Law on the Activities of Expertise
7. LEORIJE - Law on Establishment and Operation of the Republican Institute for Judicial Expertise in the Field of Finance, Financial Operations and Traffic
8. M-CC - Criminal Code of the Republic of Macedonia
9. M-CCP - Code of Criminal Procedure of the Republic of Macedonia
10. MoJ - Ministry of Justice of the Republic of Macedonia
11. N-CCP - Draft version of the new Macedonian Code of Criminal Procedure
12. S-CCP - Code of Criminal Procedure of the Republic of Serbia
13. YPA - Yugoslav People's Army

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2. Code of Criminal Procedure (“Службен весник на Рејублика Македонија” бр. 15/2005 - consolidated text, 83/2008, 67/2009).
3. Code of Criminal Procedure of Bosnia and Herzegovina (“Službeni glasnik Bosne i Hercegovine” br. 3/2003, 32/2003, 36/2003, 26/2004, 63/2004, 13/2005, 48/2005, 46/2006, 76/2006, 29/2007, 32/2007, 53/2007).
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VEŠTAČENJE KAO DOKAZNO SREDSTVO

Rezime

Radna verzija novog makedonskog Zakona o krivičnom postupku (N-ZKP), u grupi dokaznih sredstava, pored iskaza optuženog, svedoka i uviđaja i rekonstrukcije, predviđa i veštačenje. Ovo dokazno sredstvo se određuje kad za utvrđivanje ili ocenu nekog važnog fakta treba pribaviti nalaz i mišljenje lica koje raspolaze potrebnim stručnim znanjem, ako to može pomoći za ocenu dokaza ili za utvrđivanje pravno relevantnih fakta.

Regulisanje više aspekta veštačenja, među kojima i njegovo određivanje, dužnosti i izuzimanje veštaka, postupak, zapisnik, različite vrste veštačenja i sl., u članu 21 N-ZKP-a, ukazuje na ozbiljni pokušaj za njegovo celokupno pravno definisanje.

Summary

The Draft version of the new Macedonian Code of Criminal Procedure (N-CCP), in the group of means of evidence, besides the defendant's statement, the witness and the on-site inspection and reconstruction, provides also the expertise. This mean of evidence shall be ordered when it is necessary to provide a finding and an opinion from a person who has the necessary professional knowledge in order to determine or assess some important fact, if it can help for assessing the evidence or for determination of the legally relevant facts.

Regulating several aspects of expertise, among which its ordering, duties and exemption of the expert witness, procedures, minutes, different types of expertise, etc., in 21 articles of N-CCP, points out the serious attempt for its entirely legal defining.

CRIMINAL ACTS REALIZED WITHIN SPECIAL GAMES OF CHANCE

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Abstract: The authors of this paper have attempted to systemize certain solutions within the laws that deal with criminal acts against the computer data security for the special games of chance, such as the games organized in casinos on electronic roulettes. Moreover, the authors of this text attempted to describe new modes of criminal acts of fraud and fraud by employees, as well as other examples of fraudulent acts upon electronic roulettes in casinos (gaming facilities). By introducing the Law on Games of Chance in 2004 and creation of Games of Chance Administration beginning 2005, the Republic of Serbia legalized games of chance, thus opening the possibility of realization of winnings in money, material goods, services or certain rights, directly or indirectly, and registered them in the Games of Chance Catalogue. This theses actually an issue, has not been explored in our region, and there is no information in regards to the Criminal Police Department work in solving these criminal cases.

Key words: special games of chance, casino (gaming facilities), fraud, electronic roulette, practice.

1. Introduction

This expert paper's authors' intention is to portray positive-legal rules that regulate games of chance and certain appearance modes of criminal acts encountered by the organizers of games of chance on electronic roulettes, during their working hours. Direct findings of the electronic roulette casino fraud issues are collected empirically, from the organizers on the home turf, and indirectly over the network of their business associates in regional countries (Slovenia, Croatia, Bosnia and Herzegovina, Macedonia, Romania, Bulgaria, Italy, Check Republic, etc.). Having scarce literature on this problem area, and based

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on the above mentioned verbal statements, we tried to present, as precisely as possible, the modes and methods in which it is possible to accomplish this type of fraud.

Up to date technical-communication devices, resourcefulness of con-men, their unscrupulousness in obtaining illegal gain while playing special games of chance, create problems for the games of chance organizers, bringing them into a position of constant monitoring, audio and video, of their guests and employees, and in this way acquiring material proof. How big of a problem this creates for the games of chance casino organizers speaks the fact that there is not a single one crime report filed against a gamer or a casino employee, even though there were founded suspicions of illegal acts execution or use of sophisticated technical means to augment the possibility of a win.

Constant quality cooperation with, the Ministry of Interior of Republic of Serbia, especially with the members of the specialized services of the Criminal Police Directorate – the Department for High-Tech Crime Prevention, the Division for Prevention of Organized Crime, and the Department for Fraud and Forgery Prevention of Criminal Police Directorate, the Police Directorate, City of Belgrade, as well as other casinos in the country and the surrounding region, could present a precondition for prevention of criminal acts in casinos with gambling machines and electronic roulettes.

2. Positive-legal regulations that organize games of chance problems

It has been since 2004 that the Republic of Serbia introduced games of chance (gambling) into the legal stream, by creating the Law on Games of Chance¹. This negative social behavior spread through all levels of the society. The LOGOC (Law on Games of Chance) has undoubtedly limited the gambling possibilities, and on the other hand enabled monitoring of the game organizers. This Law also enabled public revenue collection from the games of chance, and in return became a significant source for budget income² of the Republic of Serbia. Prior to the LOGOC there were short term resolutions to allow gambling on single automats or a single paying station in casinos. Practice proved that the possible risk of void of payment of winnings was great, and on the other side there was a great possibility that the organizers of games of chance avoided paying complete public revenue.

¹ The Law on Games of Chance was drawn up on July 23, 2004, proclaimed in the Official Gazette of the Republic of Serbia no. 84/04, and came to power on August 01, 2004.

² Income is distributed in such a way that 60% goes to the RS budget, and 10% each belongs to Finance fund for organizations for physically impaired and social protection institutions, Finance fund for socio- charitable activities, Finance fund for local self-managing programs respectively.

The Penal Code of Serbia³ in Chapter XXXI – Criminal Acts against Public Peace and Order, in Article 352, defines a criminal act of Unauthorized Organization of Games of Chance. This criminal act can be undertaken by any person who unlawfully organizes games of chance, and the specter of penalty ranges from monetary up to two year imprisonment. Organizers of these games or the gamers themselves could be punished with three months to five years of imprisonment. Means intended for or used for the execution of this crime, as well as the money and other objects used in the game of chance would be taken away.

The LOGOC defined Games of chance as *games in which participants, with direct or indirect charge (through accounting added telephone impulses, etc.), are given opportunity to realize a gain in money, material goods, services or rights, in addition, the ultimate result does not depend solely on knowledge or craft of the gaming participants but also on mere coincidence or uncertain event.*

The Organization of Games of Chance is the type of activity of common interest for the Republic of Serbia, therefore the Republic of Serbia has rights to the organization itself. The Republic is allowed, in correlation with the LOGOC, to transfer the rights to the game organizers, that is, to the legal persons who reside on the territory of the Republic of Serbia. The rights are transferred on the basis of license, permit and agreement (given by the Games of Chance Administration) which cannot be transferred to a third party. The organizer is liable to submit the game rules with each submitted new game of chance application. The game rules have to be posted on a visible place in a game room.

The games of chance could be classic games of chance, special games of chance and prize-winning competitions with prizes in goods and services. Classic games of chance are lottery, sport betting, lotto, tombola, fonto, etc. Special games of chance are the games organized in casinos, in which the gamers play against the house or against each other, at gaming tables with balls, dice, cards and other similar props, games organized on machines and sports betting and other events.

The LOGOC has raised the criteria for the organization of games of chance (financial, technological, special), but has also foreseen founding of the Games of Chance Administration⁴, as an administrative body within the Ministry of Finance. The Games of Chance Administration monitors game organizers' ac-

³ Official Gazette of the RS, no. 85/05, no. 87/05, no. 115/05.

⁴ <http://www.mfin.sr.gov.yu/src/120/>

tivities and takes care that the LOGOC and numerous sub-legal resolutions⁵ which regulate this area are placed in action, as well as pointing out irregularities in public revenue charge resulting from the LOGOC.

Special games on the gambling machines could be organized by the legal person with their base in the Republic of Serbia, providing they possess basic capital investment in local currency (dinar) of 150 000 Euro, written in corresponding register. In order to ensure payouts of the winnings to the gamers and regulating public revenue obligations, the organizer has to have a bank deposit in Serbia, of 300 Euro (in local currency – dinar) per gambling machine or possess a bank guarantee on established amount and mandatory submission of the Ministry's authorization over the management of funds of this specific-purpose deposit for anticipated cases. The LOGOC further defines process of allowances and conditions for possessing at least 100 gambling machines which the organizer has to have on the territory of the Republic as well as the allowance expiration period of three years. The appeal against the judgment on license request is not allowed. The Games of Chance Administration has the right to revoke the license in case of deviation from license terms and conditions. The organizers' liability in reporting gambling machines and locations within a time limit is regulated.

Charge for acquired machine game organizing license is payable in local currency and amounts to 300 Euro per year per machine. The payment of 50 Euro (in local currency) for down payment per machine per year is also established. If the game organizer realizes yearly turnover of 6.000 Euro (in local currency value) per machine, he has to pay 10% organization charge. Game organizer is due to fulfill certain informatics conditions, which include creation of unified database on pay-ins and pay-outs realized on each machine, define its location and connect it through computer or telecommunication network to the Games of Chance Administration.

The adopted Decrees and Rules, along with the LOGOC, define that in addition to the minimum base capital of 150 000 Euro for the organizer who applies for the license, even to 1 000 000 Euro for the realization of special games of chance in casinos for legal persons, it is necessary that even civilian person – the owner, should not have a conviction record five years prior to filing, to have at least a hundred machines (which could be or not be his property) and that those machines must have passed the control in the Directorate for measures and precious metals⁶, where each type of gambling machine should be registered.

⁵ Decrees, Rules and decisions are cited under literature.

⁶ <http://www.szmdm.sv.gov.yu/index.php>

Each type of game of chance machine, for the safety of the gamers, has to be attested at the Directorate for measures and precious metals by the official technician, who establishes on a yearly basis whether the gaming machines fulfill technical and functional characteristics described in the service booklet. The service booklet has to be kept at the official service place and presented to the Internal Revenue Service for inspection, upon request. Every machine has to be marked with a sticker issued by the Games of Chance Administration and printed by the Institute for Manufacturing Banknotes and Coins, in such a way possible forgery of the same is avoided in the best manner.

As the emphasis of this paper is on the special games of chance, and solely those games which are organized in casinos – on gambling machines and electronic roulettes, the rest of the paper will deal only with topics related to these games.

Special games of chance in casinos could be organized by legal entity having the headquarters at the Republic of Serbia territory, based on the license issued by the Government of the Republic of Serbia. The license for organizing special games of chance in casinos can be acquired by legal entity, who in addition to having fulfilled other conditions created by the LOGOC must have base capital in the amount of 1.000.000 Euro in local currency on the same day when acquiring the license, also that the legal entity is obliged to maintain the base capital to the same amount. Due to winnings' pay out insurance and ensuring public revenue payments, the LOGOC expects the organizer of special games of chance, to have a bank deposit of 300.000 Euro in local currency, or bank guarantee in such an established manner, and to give the authorization over management of funds of this specific-purpose deposit to the Republic of Serbia for the same period the license is active. In addition to the above mentioned conditions the organizer must secure a risk-deposit at the casino cash desk, each day the special games of luck are organized, to the amount of 50.000 Euro in local currency. In this way the interests of the State, budget, and the gamers in casinos, are secured.

The license issuance process is defined in the LOGOC, and the license for organizing special games of chance in casinos is issued for ten years with the possibility of extension. The legal entity which obtained the permit to organize special games of chance in casinos, signs the contract with the Republic of Serbia on transferring rights to organize the special games of chance. The organizer of special games of chance is obliged to report every table and machine used for games of chance to the Games of Chance Administration at least 48 hours prior to placing them in use. The LOGOC creates conditions, on what basis the competent Ministry can present a proposal to revoke the organizing special games of chance in casinos license.

The charge for the acquired license is paid on the deposit account of the Treasury. The charge for organizing every special game of chance in the casino is paid in the percentage and upon the proposed base. For games that gamers play against each other 3% of the pay-ins value, and for the rest of the games 25% on a difference between pay-ins and paid-out winnings minus the worth of the promotional chips. The LOGOC also defines guidelines for keeping the log on base value for calculating and paying the compensation, also proposes the way to inform the Administration on inputs and lend-outs.

Space conditions within the casino must be planned so that the room for gaming, room for guests and employees of the casino is a whole, that the casino has a reception service which will identify the parties entering the casino, to have a cash desk, exchange office, and separate, protected money storage area. The casino could be placed either in separate facilities, specially arranged for that occasion, or in catering establishments in which there are accommodation services marked with five, four and three stars – hotels or apartment complexes. The organizer is obliged to provide constant audio-video surveillance with recordings of entries and exits from the casino, above all tables and game machines, as well as surveillance of gamers and visitors, he is obliged to keep such documentation ten days, and longer if warranted by the Games of Chance Administration. The data acquired in this way are regarded as business secret.

Game organizer is also obliged to provide body guards for the gamers and visitors in accordance to the regulations that propose protection of property and persons. The conditions for entering the game room are determined by the organizer, therefore he can forbid certain individuals or group of people to enter, and is under no obligation to give any explanation. Therefore, the so-called data banks are created about common or persons inclined toward property and other criminal acts, and are kept up to date on a daily basis and exchange between casinos, in order to prevent criminal acts of fraud or some other criminal acts. If the gamer violates game rules during the game of chance, the organizer can forbid his further involvement in the games. This will be covered in detail relating to the modes of criminal acts within special games of chance.

Entrance into casinos is permitted only to individuals of full age, while the organizer is obliged to create database including each individual's Personal ID number, Identification Card or Passport number, and the date and time of entrance and exit. If there is justified conviction that a certain individual does not have sufficient income or their material situation does not allow them to or limits their participation in games of chance, the organizer can permanently or for a limited time prohibit the entrance to the casino or limit his visits. In this way the organizer of the special games of chance has a discretionary right, on the basis of individual assessment, to decide whether certain visitor fulfills the norms

for the minimum property (money) requirement for any type of gaming participation. The manner in which the assessment of potential gamers is done varies from casino to casino. Thus in the Western countries' casinos entrance will be allowed, with prior ID check, to any individual, up to the room in which the money is exchanged for chips. In this room, a potential gamer will show whether or not he has the adequate amount of money for certain game in the casino and on this basis acquires the right to engage in the game. In our country, casinos have stricter standpoint, there in no internal rule to forbid the entrance to persons at the casino doorway, except providing that the doorman or security service sense that the potential gamer doesn't have adequate amount of money, without prior check of material situation at the cash desk. On the other side, in the USA the gambling industry has more liberal stance with regards to the question of potential gamers' approach, enabling gaming even with money lent from the casino itself, for certain (continuous and "credit worthy") players. In our country the LOGOC forbids casinos to lend out money or internal casino means (chips, electronic credit, etc.) to the gamers in casinos.

Individuals in uniforms are allowed to enter the casino only during their duty hours. Every approach of an individual in uniform is recorded, and such an individual is obliged to identify himself by presenting official ID, his arrival time and departure is recorded, as well as the reason of his presence in the casino.

Visitors and gamers are not allowed to bring in any technical devices, that could aid them or other gamers in creating an advantage in gaming, so if there is so much as a founded suspicion that someone possesses them, the organizer will remove them from the casino. The organizer does not have to actually see or find the device and thus provide material proof, since the organizer of special games of chance does not have the authority to search the individuals, as do the police for instance - from the Laws on Police Force⁷ and The Criminal Proceedings Code⁸. With regards to this there is a justified question posed to the organizers of the special games of chance, which technical devices are allowed to be brought in, and which are not, i.e. if a cell phone that has an operational system Windows mobile, bluetooth and/or infrared connection with other technical devices, camera with 8 MP resolution, with a software solution that can analyze the ball movement in roulette and thus determine approximate numbers where the ball will stop is allowed.

In order to perform certain jobs at the casino the employees need to have licenses issued by the Games of Chance Administration. Casino employees are

⁷ Official Gazette, no. 101/05

⁸ Official Gazette SRJ no. 70/01, 68/02 and 58/04

not allowed to accept tips, presents, loans or other gains from the gamers either for themselves or others, or to financially help the gamers. In special cases gamers may give tips for running of certain special games of chance, not directly to the croupier, but place it into special boxes⁹ kept on the gaming tables, and the collected money meant for tips are a part of the organizers' income. Out of the cited conditions proposed by the LOGOC and following bylaw regulations, we can notice a clear intent by the legislators to protect the State interests, which is good. The budget of Serbia gains 70 to 100 million Euro of annual income in this manner. However, there is a question of protection of the special games of chance organizers' interests, who encounter the perpetrators of property and other criminal acts on a daily basis. It should not be forgotten that the organizers are the ones who have to comply with many financial, technological, and other conditions proposed by the LOGOC and following bylaw regulations, and that the LOGOC itself has not provided for any criminal act performed by the casino visitors, gamers and casino employees.

3. Forms of appearance of certain criminal acts on special games of chance in casinos

Modern casinos are high tech areas, where specially produced security and informatics equipment dominates. Such a technical-technological assembly of informatics and other equipment is necessary because of the conditions laid out by the LOGOC.

Informatics equipment in modern casinos represents the state-of-the-art generation of computers and servers creating its intranet system secured by hardware and often physically secured (separated) from outside surroundings. Software that serves this integrated informatics-secured system is intentionally created. System of informatics supervises the work of all electronic devices in the casino, also the telephone system, audio and video surveillance integrated system, especially the games of chance machines work, employees' work in the gaming rooms, exchange office, cash desk, and the money storage area, as well as visitors' and gamers' whereabouts.

The integrated control system for audio and video surveillance inside and outside of the premises is based on the CCTV¹⁰ system. Modern day cameras produce high quality pictures, and teleobjectives with optic zoom up to 30x en-

⁹ «Cagnotte» – see the LOGOC

¹⁰ Closed circuit television B.C. Welsh, D.P. Farrington: “**Crime prevention effects of closed circuit television: a systematic review**”, Home Office Research Studies, Development and Statistics Directorate, 2002.

able object augmentation, without the loss of video signal quality, with automatic transfer from good illumination to poor. Cameras are placed at various places in casinos, in both the closed and open areas, and can be either noticeable or concealed in common objects, therefore hidden from persons who have no knowledge of their precise location. The surveillance operators have numerous programming options over integrated interface including, white color balance, light changes, back light compensation, video signal synchronization and reduction of noise. All audio and video signals are recorded digitally on digital recorders with capacity over 1 TV.

On the basis of the above mentioned casinos' technical-technological characteristics, its operating center presents actually an area in which an enormous amount of data is processed. Audio and video recordings obtained from CCTV are converted into digital data recognized by the computer and available for further processing and exploitation. It is the informatics-security system that creates an obstacle for the executors of various criminal acts in casinos upon gambling machines and electronic roulettes, actually on those devices that do not have croupiers, and therefore do not have constant supervision by the casino official.

A perpetrator of a criminal act in casinos can only be an adult (they are allowed to enter a casino) of both sexes, in various positions, as a non playing visitor, who is looking around and probably using the follow up services a casino offers, a gamer who gambles, an employee, as an official of a casino, and one of co-owners of a casino.

The perpetrators commit various criminal acts in casinos, and they can be somewhat systemized depending *modus operandi*. Following in the paper the methods of various criminal acts are portrayed, that the authors of the text learned about from the direct contact with several organizers of special games of chance in casinos:

- The gamer in casino purchases from the employee at the paying station a certain amount of credit in correlation with the certain amount of money. With the obtained credit in such a manner the gamer approaches electronic roulette and begins the game against the electronic roulette (or other players, but in this case the gamer waits for the opportunity to remain alone at the electronic roulette). As the employee goes away from the gaming place, the gamer with appropriate object, most often with a drill, drills a couple millimeter whole at the top of the roulette cylinder, slides in a metal bending wire, catches the ball that is rotating on the circumference of roulette and pushes it onto a number he previously placed the money -credit¹¹ on. This method of criminal act of fraud¹¹ can

¹¹ Article 208. Criminal Code of the Republic of Serbia

be committed in collaboration with a person who monitors the gamers, visitors and employees, but not necessarily since the perpetrator counts on that he would not be noticed by personnel in charge of controlling the improper gaming practice of gamers.

- The gamer comes to illegal possession of a copy of the coded key used for credit payment on the machine or electronic roulette. The coded key should be possessed only by the manufacturer who makes the gambling machines or the electronic roulettes and the organizer. The manner in which the copy of the coded key comes into illegal possession by the gamer is possible only by the arrangement with the manufacturer (or one of workers who possesses the original coded key) of the gambling machine or electronic roulette or by the agreement with casino co-owner, who wishes to obtain illegal profit to the other owner's detriment. The profit obtained in such a manner is divided among all criminal act collaborators. Even in this case the personnel in charge of inside casino monitoring should be able to notice the illegal manner of realized profit on a certain gambling machine or electronic roulette, provided that he is not a collaborator in criminal act. Unless there is a video recording, or the recording has time lapses at the supposed time the crime is committed, it is a strong indication that there is collaboration between the gamers and surveillance personnel, but also casino's co-owner. The time and the amount of the winning is recorded in the memory of the gambling machine or electronic roulette and serves as control data, as for the organizer of special games of chance so much for the Games of Chance Administration which supervises the special games of chance organizers' work.

- Casino co-owner usually alone, without employees' help and after working hours, with purpose of obtaining illegal gain to the other owner's or several owners' detriment, interrupts audio and video surveillance over the casino area where the game machines of electronic roulettes are placed, opens the protective cover of the machine or roulette and commences manual placing of numbers on the analogue machines of older generation or the ball at the electronic roulette and in this manner simulates the win, which pays out to himself. As the co-owner has a status of a worker he commits criminal act of fraud at work¹².

- Casino employees as workers, who according to the LOGOC do not have the right to engage in games of chance in the casino where they are employed, on a self initiative or in collaboration with a casino co-owner (who wishes to obtain illegal gain to the other owner's or several owners' detriment), start up the machines or electronic roulette, most often after working hours, place certain amount of credit, not previously bought for money at the cash desk, gamble

¹² Article 363. Criminal Code of the Republic of Serbia

and dependent on whether they acquire certain profit or not, damage the casino owner on two bases. The first basis manifests in that the gamer realized profit void of the LOGOC, and the other basis manifests in the owner's obligation to public revenue payment, the amount determined by the LOGOC in percentage, and on the basis of gamers' payment regardless whether it is fictional or real. The employees or the co-owner commit, in this way, criminal act of fraud at work.

- A gamer in the casino with the use of force or serious threat forces the employee to enable him to play on the game machine or electronic roulette, without prior purchase of credit for money at the cash desk, and in such a manner realizes illegal gain. This method of criminal act¹³ is possible only in casinos that do not have physical casino protection although the special games of luck organizers are obliged, according to the LOGOC, to provide physical protection for the gamers and all individuals, even employees, at the casino.

- A gamer who gambles at the gambling machine or electronic roulette uses temporary software or hardware error on electronic device, obtaining gain void of rules proposed for a certain type of game on one of electronic devices in casino. If they manage to collect the winnings that they obtained in the above mentioned manner, then they damaged the special games of chance organizer. It is a common practice that the game organizer posts a noticeable warning on each of the gambling machines or electronic roulettes in his casino, where the gamers are warned that they will not realize their wins if there is any malfunction of electronic device during the game.

Considering the criminal aspect the commission of certain criminal acts against computer data security is of special interest, these are contained in Chapter XXVII of the Criminal Law Book of the Republic of Serbia. When we speak about special games of chance, most often committed is computer fraud¹⁴, damage of computer data and programs¹⁵, unauthorized access to a protected computer, computer network and electronic data processing¹⁶.

Direct inspection of the casino practice, points out that the most often committed mode of criminal act, from the criminal acts against the security of computer data group, is the criminal act of computer fraud, where the executor inputs incorrect data, attempts to avoid inputting correct data or in some other way conceals or falsely presents data and in this manner affects the electronic processing result and data transfer with intent to obtain for himself or other

¹³ Article 214. Criminal Code of the Republic of Serbia

¹⁴ Article 301. Criminal Code of the Republic of Serbia

¹⁵ Article 298. Criminal Code of the Republic of Serbia

¹⁶ Article 302. Criminal Code of the Republic of Serbia

party, illegal gain and in this way cause property damage. This is a criminal act most often encountered by the special games of luck organizers on gambling machines and electronic roulettes, here and in the surrounding region, and through information exchange between casinos, there is a founded doubt that this device is most probably manufactured by the ones who manufacture roulettes.

The authors of this paper were not able to verify these findings by the inspection of relevant literature or some expert thesis, because there are none that deal with this issue. The source of information and the data connected to the already mentioned issue come out of practice, they are empirical in background. The issue itself deals with specific and practical use of devices that are produced and used to the sole purpose of electronic and computer fraud on electronic roulettes, and there is not any kind of official publications on this, which is understandable. It is of interest and very significant for services that engage in prevention, disclosure, and verification of fraudulent acts of this type, to have direct knowledge from practice, actual surroundings, because these findings open the door to new solutions in substantial battle against crime. In short, the authors' intent is to describe the execution methods and to attempt to explain the manner in which to verify certain forms of computer fraud on electronic roulettes while not getting into detailed technical explanations because it would lead away from the basic intention and goal of this paper.

Gaming process on the electronic roulette is based upon software that enables, over the processor which is a hardware piece of electronic roulette placed inside the roulette cylinder, generating in each new round of game different random numbers¹⁷, warranting that number acquired in this manner is with high probability different from the previous. Random number generated in such a way is made able by interchangeable work of some mechanical and electronic connections in electronic roulette, that aid in diverse final outcome – the winning number on which the ball stops.

- Criminal act of computer fraud is committed with the aid of specially constructed unconventional electronic device that emits a signal on a certain frequency. The device frequency (WHEAL-TRACKER)¹⁸ affects the hardware component work on the roulette (the sensor) and in such a manner displays a win (a number the bet is previously placed on) before the ball actually hits the number. The ball hits a different number, but since the processor recognized a

¹⁷ See more in M. Nedeljkovic, M. Stojcev: „**Generator pseudoslučajne sekvence baziran na mikrokontroleru**“, available on web address <http://es.elfak.ni.ac.yu/Papers/Nedeljkovic-Stojcev-rad-za-Hipnef-2008.pdf>

¹⁸ Jargon term. This device can be put together only by individuals involved in electronic roulette manufacture or ones who are familiar with electronic roulette principals of work.

set up number as the winning number, in this phase does not make a double check whether it is a real winning number. The next phase for the processor is the data processing, so this is how the illegal gain is realized. The operating mode: a gamer who has an intent to execute fraud with this device in collaboration (pay off) with an employee or a manager or by employee coercion turns off the video surveillance above the roulette, and by physically distancing the employee away from roulette, so he would not be able to witness the fraudulent act and operating of the device, he begins the game and turns on the device. Following the conclusion of the game, while the gamer who committed fraud waits for his winnings, the other collaborator, exits the casino and takes away the device. In case of a search by suspicious managers, that can be done only visually, the device is not found, therefore there is no proof of fraud. The principle on which there could be justified suspicion of fraud is the lack of video recording, enormously high winnings, repeated numbers in a row and frequent mistakes recorded in database on the game integrated in the roulette. This is why casinos use a simple but efficient tactics in order to undermine the use of this device – performing direct control of winnings on gambling machines and electronic roulettes. Some roulette manufacturers invented a specific system by perfecting the electronic roulette software and managed to avoid this form of fraud. However, a relatively small number of electronic roulette manufacturers use these software solutions, thus there is a lot of space to use up-to-date electronic devices for criminal purposes¹⁹.

- On the basis of some knowledge on forms of fraud on electronic roulettes, there is also a possibility of fraud through a separate computer which is in *on-line* connection with electronic roulette. This connection can be made only if the roulette is in connection with the Internet. The operating mode: a hacker is physically remote from the casino and with the aid of a collaborator who is at that moment inside the casino sitting at the gaming place at electronic roulette, commits fraud in a way that the credit (amount of money which reads out on electronic roulette in form of a credit) is imputed on the gaming place without actual money being given, i.e. without paying money at the cash desk. The collaborator paid some money, in order to approach electronic roulette and begin the game, to the casino employee at the cash desk, and enable the game; in return the amount of credit would be falsely exaggerated later by the hacker and *on-line* connection with the roulette. This form of fraud can be revealed by accessing the game history which is in data base of the roulette.

¹⁹ The data on this specific issue are gathered together and apply to the territory of the countries of Southeastern Europe: ex-Yugoslav republics, Romania, Bulgaria, Check Republic, etc.

- The unauthorized use of computers or computer network undergoes also when the executor makes an illegal access, in some convenient way, with suitable technical aid, to casino's intranet computer network and uses some computer service with intent to acquire, for himself or a third party, illegal property gain. The executor usually connects (over wire or wireless over router²⁰) with casino intranet. With specially produced software, that serves to enable intranet access, with prior password deciphering²¹, exploits all available data, which he can offer to a third party, in exchange for goods, service or money such as: the identity of gamers, the placement of surveillance equipment, the casino employees' identities, etc. The knowledge of this specific form of fraud was indirectly available to the authors, i.e. from literature, regarding concrete examples from direct practice and casino practice in the country and neighbouring countries are not yet noticed, so it is supposed that this form of computer misuse in casinos still lacks strong motivation (which is often connected to financial benefit).

Being aware of these threats, the special games of luck organizers have the possibility, given by the LOGOC, by utilizing constant audio and video surveillance of the gamers, visitors and employees, to observe that the visitor, gamer or employee use an unauthorized technical aid (which they do not have to bring into the casino), in order to obtain illegal gain on the basis of gambling void of proposed rules for a certain type of game and have the right to remove such an individual from the casino.

If the gamer accessed the casino intranet network, but did not manage to realize a win, that is did not realize an illegal gain, then it could be concluded that the following criminal acts exist:

- Damage of data base and program – providing the executor erases, damages, hides or in any other way disables computer data or program or,
- Unauthorized access to secured computer, computer network and electronic data processing – if the perpetrator, violating security protocol, makes an unauthorized entry into the computer or computer network, or makes an unauthorized entry into electronic data processing, or misuses data in the above described fashion.

4. Conclusion

Whenever there exists a possibility to make an illegal and quick way to gain money or by committing various criminal acts that enable acquiring illegal property gain in casinos, there will be attempts to attain certain benefits in various

²⁰ Computer device used for computer connection into a network.

²¹ See more in S. Landau: „Communications security for the twenty-first century: The Advanced Encryption Standard“, Notices of AMS, 47 (2000.), 450-459.

ways. Regarding positive–legal regulations that organize game of chance problem in the Republic of Serbia and some new forms of various criminal acts, and that, from the general domain, and also computer criminality, very interesting methods of their execution are presented.

The authors' intention was, not with this paper but a future one, to encompass the issue of obtaining evidence that could serve a more successful guidance for a criminal process. Therefore, it was only a run down of the most important legal regulations on the basis of which the evidence in connection with the commission of criminal acts cited in the previous chapter could be secured.

With regards to material proof, that is the use of audio and video recordings made in casinos, The Law on Criminal Procedure does not have explicit regulations on their relevance and validity in criminal process. In our opinion this material could be presented as evidence, since there is legal obligation to place audio and video surveillance in casinos and that the warning on their use is publicly displayed. Therefore, the individuals consent to recordings by entering and remaining at the premises, so it could be deducted that the audio and video recording obtained on basis of the LOGOC object that could be presented as evidence.

In certain amount the authors wanted to interest wider scientific and expert public and point to the existence of new forms of social–pathological occurrences that in the near future, with rapid technical development and crafty adaptations by the perpetrators of these criminal acts could easily slip lawful control and in a wider sense, social control.

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KRIVIČNA DELA KOJA SE VRŠE U SKLOPU POSEBNIH IGARA NA SREĆU

Rezime

Rad se prvenstveno bavi novim pojavnim oblicima različitih krivičnih dela kao što su prevara, prevara u službi, ali i raznih krivičnih dela protiv bezbednosti računarskih podataka u okviru posebnih igara na sreću, kao što su igre koje se priređuju u igračnicama na elektronskim ruletima. Autori teksta došli su do neposrednih, empirijskih saznanja proisteklih iz prakse domaćih priređivača posebnih igara na sreću na elektronskim ruletima koji se svakodnevno u svome radu susreću sa izvršiocima pomenutih krivičnih dela. Izvršioci po pravilu pokušavaju da na razne nedozvoljene načine obezbede sebi nelegalni dobitak i na taj način ostvare protivpravnu imovinsku korist, a na štetu priređivača posebnih igara na sreću i na štetu naplate javnih prihoda koji su ostvareni na osnovu priređivanja igara na sreću. Donošenjem Zakona o igrama na sreću 2004. godine i obrazovanjem Uprave za igre na sreću početkom 2005. godine (koja deluje kao organ uprave u sastavu Ministarstva Finansija), Republika Srbija je uvela u legalne tokove igre na sreću, koje mogu uz neposrednu ili posrednu naplatu da pruže mogućnost ostvarenja dobitka u novcu, stvarima, uslugama ili pravima, koje su upisane u katalog o vrstama igara na sreću, za čije su priređivanje donešena pravila igre i da su ispunjeni svi ostali uslovi koji proističu iz Zakona o igrama na sreću. Ova problematika do sada nije istraživana na našim prostorima, a u vezi rada kriminalističke policije na rasvetljavanju ovakvih krivičnih dela ne postoje saznanja. Rad bi, svakako, pokrenuo niz pitanja o načinu otkrivanja, razjašnjavanja i dokazivanja ovih krivičnih dela koja se izvršavaju u igračnicama.

Summary

The paper deals primarily with the new manifestations of various crimes such as fraud in general, fraud by the employees, and various criminal acts against the security of computer data in certain games of chance, such as

electronic roulette. The authors of the text made direct empirical discoveries resulting from the local electronic roulette games of chance organizers' experiences, who encounter these crime perpetrators on a daily basis. It is common practice that the perpetrators attempt, in a variety of illicit ways, to realize the illegal gain and thus obtain profits to the detriment of the special games of chance organizers and at the expense of the public revenue income realized from these games. The Republic of Serbia introduced the Law on Games of Chance into the legal mainstream lottery games in 2004, and created the Games of Chance Administration in early 2005 (which acts as an administrative body within the Ministry of Finance); these games may, with the direct or indirect payment, open the possibility of gain in money, goods, services or rights, registered in the games of chance directory, and for organizing of the same there are rules issued and certain conditions met, resulting from the Act on Games of Chance. These issues have not as yet been explored in our region, and we have no knowledge in connection to the work of the criminal police department in solving these crimes. The paper would surely launch a series of questions on the process of discovery, resolving and verifying these criminal acts committed in casinos.

DRUG ADDICTION, POLICE AND NARCOTIC-BASED CRIME

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Abstract: In the introductory part of the paper the authors were involved in reviewing the problem of drug abuse and drug-related crimes as socio-pathological phenomenon with a wide range of criminal consequences. They also give a brief overview of the genesis and development of the basic causes of the wide prevalence of this phenomenon in the society. After that there is a cohesive review of the factors of drug addiction and crime (primary, secondary and tertiary drug-related crime), while the central section is devoted to typology and characterization of persons in the sphere of drug-related crimes and their relation to the police, as one of the entities that are actively involved in combating this social evil.

Keywords: drug addiction, police, drug-related crime.

1. Introductory review

According to one study a profit from selling drugs makes in fact 8% of the total profit realized in world trade, which is more than the participation of trade of metallurgical products in the world (Modli, 2002). The profit amounting to 500 billion a year in the international trade in narcotics presents the second level of cash income, behind the international arms trade (M. McConville, 2000). The value of transactions related to drug trafficking only in the UK reaches 1% of GDP (*Gross domestic product*), or in figures 8.5 billion pounds a year (Proceeds of Crime, 2001). On the other hand, the number of persons who are commonly considered as drug addicts or problematic drug users is about 25 million worldwide, which amounts to 0.6% of the population aged 15 to 64 years (Council of Europe, 2006). In addition to the harmful consequences of misuse

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of drugs, the activities of organized criminal groups produced at national levels are reflected in the destabilization of governments and financial markets, the corruption of public officials and the increase of social costs for health care (CoE, 2006), due to the enormous economic potential of the drug trade and the global threat, very often associated with terrorism, which is the greatest challenge of our time in terms of global stability and security. It is estimated by the international experts that amount of 95% of all revenues at the world level, realized by illegal drug trafficking, goes on funding terrorist organizations and networks (Ured za suzbijanje zlorabe opojnih droga, 2005). It seems that it is no coincidence that each of the three countries with the world's largest amount of opium producing result and crops of coca in the fields (Afghanistan, Burma and Colombia) has permanent rebellions financed with the money from the drug sale, in which terrorist actions have become common occurrences of everyday life (Winer 2002).

The profitability of illegal drug trafficking is a key factor for attracting persons belonging to the criminal milieu. Illegal trades in narcotics activities include well-equipped and organized criminal groups of transnational character, with enhancements and specializations in improvement of their methods of operation on a daily basis, and also constantly keeping up with the technical and technological development, using its benefits and methods of adopting them in their own criminal activity. On the other hand, the prosecution authorities are given the very difficult task of proving the role of leaders of criminal organizations in the illegal activities of drug trafficking, with the effort to bring to justice the vast majority of persons involved in smuggling chain activities. For accomplishing these ventures it usually takes many years of hard police work in cooperation with other relevant stakeholders (prosecutors, judiciary, customs, inspection bodies, etc.). However, the removal of the leaders of criminal groups from the criminal stage does not necessarily lead to the termination of their organizations' actions, and it is well known that from the existing core of new leaders usually some new are to be recruited, while engaging more new members, and again in search for the methods that would make this fight more efficient.

Drug trafficking is not, as it was deemed to be shown, by the beginning of 1980s, something that happens exclusively in the developed Western countries, and as a phenomenon that was in marginal importance of our society. Namely, in 1970s it was considered that drug-related crimes in our area almost did not exist. Accordingly, the very phenomenon did not have great importance. The number of drug users was small, it was mainly about the opium addicts, and they were marked as such and, in some way - implicitly, excluded from social life in the communities in which they lived. The situation in our country

changed significantly, and this is influenced by numerous factors. General social crisis and atrophy of the institutions of the early 1990s prevented the adequate reaction to the new situation. The fall of standards of life has resulted in that the main preoccupation of most working-age population was struggle for survival, while their young found role models in those whose easy money activities were criminal, or at the very edge of legality. Such a social situation and the general decline in morality, as well as its logical consequence, with the absence of any effort of political elite aimed at the organized action to eliminate drugs generating factors, represented the ideal milieu for its development. The number of drug addicts has started increasing, from year to year, and therefore illegal activities of smugglers and resellers of psychoactive substances have been given a greater impetus. Consequently, there is the increase in recorded property-related crimes where the perpetrators appear as drug addicts. According to the recently adopted National Strategy for combating narcotics in the Republic of Serbia, there are processes of decomposition of the previous social system by establishing a new, still forming, together with the rise of organized crime, prostitution, trafficking and general fall of living standards of the nation. All of these only contributed to the intensification (main present concern, authors input) of drug-related problems. Huge economic losses of the society due to drug trafficking, illegal flows of money and transactions, among other things, are producing high costs of treatment of addicts, their social protection and similar problems (the National strategy for combating narcotics in Republic Serbia in 2009 to 2013, 2009).

However, the combination of poor social circumstances at the end of the last century, followed by inertia of competent institutions, cannot be considered the only reason of building the current situation. This assertion is supported by the fact that the problem of drug abuse still exists in a far more developed member countries of the Council of Europe. Tendencies in the development of illegal drug markets in Europe seem worrying. According to the European Monitoring Center for Drugs and Drug Addiction (EMCDDA), 6% of Europeans abused cannabis in 2005. Ecstasy abuse has increased before amphetamines abuse and thus became the second most widespread drug in Europe, following cannabis. The number of "problematic" heroin users is estimated between 1.2 and 2.1 million, out of which more than a half use heroin intravenously, while demand for cocaine has a rising trend (CoE, 2006). It is believed that currently 200 million people around the world (5% of world population) have used some kind of drugs, out of which 80% cannabis, ATS 17%, 7% cocaine, heroin 5% and 3% other opiates, where the largest number of drug abusers lives in the developing countries (CoE, 2005). The above circumstances speak in favor of the thesis, that the past activities of the police and other subjects involved in com-

bating drug-related crimes have not provided satisfactory results. Hence, more and more attention is focused to prevention. Foreign and domestic experience serves to the point in which we cannot achieve satisfactory results acting only *post festum* to this problem. Therefore, there is obvious necessity of preventive action synchronized with all entities that have common points with drug addiction in their work, while at the same time strengthening the implementation of the repressive activities in this field where the police should give their full contribution.

2. Drug abuse and crime

Correlation of drug abuse and crime is undoubtedly significant and arises both from nature and complexity of the narcotics themselves, which presents at the same time the personality disorder and acute disease and also socio-pathological occurrence with expressed crime-generating effects, and a rigorous and precise form of the incrimination of all activities undertaken in order to produce illegally and make trafficking in these substances, or to allow for their misuse to the others (Marinković, 2004). Research conducted on the interdependence of drug addiction and crime generally confirms the previously expressed hypothesis. Thus, for example, the main conclusion of the study that lasted almost three decades, about the relationship between drug abuse and crime, was that it was obvious that there was a significant relationship between these two phenomena (McBride, Vander Waal and McElrath, 2002). Studies indicate increased abuse of drugs among the arrested, the rising level of criminal behavior among drug users, and very tight correlation between drug abuse and crime in the general population, with significant differences in this relationship depending on the types of drugs and types of crime (McBride et al, 2002). It seems that in the period between the late 1990s and 2003, the drug-related crimes recorded growth in many EU countries (CoE, 2006). It is estimated that about 70% of crime in the developed countries are in some way connected with narcotics (di Argentine, 1996). These data can be accepted as credible for current local conditions, free estimates based on the experience of workers of the Crime Police support the hypothesis that about 70% of property crimes were committed by drug addicts, with the aim of obtaining funds to purchase drugs (similar: Vasić, 2001)¹.

The connection of drug addiction and crime has multiple emergent forms, i.e. there are different criteria based on which the dominant cohesive element in

¹ Here it is estimated that over 60% registered armed robberies committed in the street or in stores, were done by drug addicts in the course of obtaining drugs.

the phenomena are determined. The first relates to the fact that the production and marketing of drugs is strictly defined in a legal form, and any illegal activities on their production and sale present a type of crime, which is commonly called the primary drug-related crime. The secondary drug-related crime includes criminal acts performed under the influence of drugs or in order to acquire money for the drugs purchase, which would be a second binding element, while the tertiary crime, commonly called a crime related to activities of transnational organized criminal groups, is focused on the smuggling and sale of narcotics (the third binding element)².

If we would transpose the previous exposure about the drug and crime related factors onto the practical plane, we can see that the primary drug-related crime in our conditions include various forms of incriminating activities. Unauthorized production and processing of narcotic drugs at our territory were most related to marijuana, (given the previously presented data on its obtuseness and the fact that Indian hemp, whose processing creates marijuana, and which successfully grows on our soil) but it should be kept in mind that we registered the cases of synthetic drugs production, which are closer to the European trends (CoE, 2006). Other ways (possessing, trafficking, and offering for sale, purchase, possession or transfer to sales, brokerage in buying or selling) are represented in the marijuana, and other types of drugs. Each drug in the way from the production to the end user, certainly was offered for sale, kept and transmitted to the sale, but each of these emergent forms of crime is not identical in the number of cases in domestic practice, where the most often cases are possessions of small amounts of drugs and direct sales, besides before mentioned growing cannabis. The reasons for this are mainly practical - for some of the forms it is difficult to collect valid evidence even then when there is no dispute that the drug was in the possession of the perpetrator (i.e., offering to sell small quantities of drugs, when resorting to legal qualification of possession), or is extremely difficult to prove a link between the perpetrators and drugs found (due to the fact that the perpetrators are especially careful during its transport, for example, transmission in hidden suitable places of public transport vehicles). Selling drugs through network of associates and resellers, as aggravated form of this crime, was rarely detected³. The causes of this situation are not to

² Tri-parted division of drug-related crimes is widely accepted in literature, and some of the authors name these forms as cited (Bošković, Banović, 2001) while others do not (M. Bošković, 2001). There are authors who do not recognize the third type as a form of interconnection of drug addiction and crime (Ignjatović, 1996) which could be rightfull because the tertiary type presents a special international form of the primary type.

³ According to the data from research in PU Novi Sad conducted by the authors the correlation of crimes of unauthorised production and trafficking of narcotics and organized type of this

be found in this rare way, of committing criminal acts, but in the complexity of enterprises aimed at discovering and proving the illegal activities of organized criminal groups carrying out these works and in the difficulties which prosecution faces. In the primary group of drug-related crimes it relates to facilitate narcotic drugs, which is in practice usually realized through giving other drugs to enjoy and allowing premises to recreational drug use.⁴

In theory, the manifestations of secondary forms of crime can be roughly divided into two groups: 1) the criminal acts done under the influence of drugs and 2) the criminal acts carried out in order to obtain funds for the purchase of these substances. Many authors have been trying to answer the question of whether the consumption of drugs is the driving element in the formation of the will of the criminal act (*mens rea*). Although today there are numerous works on the interdependence of the influence of drugs and delinquent behavior, of which a large number of speaks positively about this interdependence, and bearing in mind the perennial own experiences in working with the population, seems the most acceptable position. The author S. Petrovic speaks of delinquency as drug addicts forced "delinquency" and said that the drug itself does not cause any form of criminal conduct, that person does not already carry a predisposition in mind, and that would not be shown in any other situation, with the other provocative cause (Petrović, 2003). Drugs only contribute for the loss of some inhibitions in the process of committing a criminal act that in a normal situation the perpetrator's personality has (Nikolić, 2001). A similar position is present and the official position of the American Medical Association (AMA) cited: "crimes of violence are rare and sexual homicides almost unknown among drug addicts" (Petrović, 2003). Crime addicts (under the influence of narcotics) are not characterized by the resort to violence, which does not mean that it is completely absent (Nikolić, 2001). Presence of violence is significant for some forms of funds securing manifestation in order to obtain drugs throughout criminal activities, which will be more discussed below.

Given the stated positions, we can say that on the national scope of actual secondary narcotics-related crime is more present as the other modality, i.e. se-

crime in 2003 was about: 287:1, in 2004, 396:6, in 2005, 601:11, in 2006, 642:11 and in 2007, 630:31. Also it has to be kept in mind that in 2003, while performing operation „Saber“ it included a criminal group of 44 suspects, all suspected for narcotics trafficking on wider area of Novi Sad town and on the rest of Vojvodina, wich gives more significance to the fore mentioned figures.

⁴ According to the data derived from the same research the number of committed crimes of giving others the opportunity to use drugs is also small in correlation with basic form of narcotics trafficking criminal act (Data for Police station Novi Sad: 2002-7, 2003-21, 2004-8, 2005-14, 2006-5 i 2007-5), which can be acounted to high „dark figure“ usually connected with this types of crime.

curing funds for the purchase of drugs criminal act. Its events are present in various forms of property crime, forgery and misuse of documents required during the procurement of drugs with psychoactive effects or, in fewer cases, fraud and embezzlement within the company or body in which the offender is employed. There is a form of drugs sale by consumers, which enables them "free" use of these substances. Although, in essence, it belongs to the primary narcotic-based crime, no doubt that this specific category of drugs users could be considered a special kind of secondary narcotics-related crime, which further indicates the strong interdependence of forms within this tripartite division. Criminal forms of securing money usually precede the abuse of trust within the family environment. Formally and legally, one cannot say that it is a crime, but it is certain that abusing the trust of parents by children, reflected in the petty thefts and selling valuable house holdings usually leads to the zone of criminal activity if not revealed before. The most common within the property crimes are theft, grand theft (burglary and breaking pharmacy, houses, apartments, cottages, commercial shops and other business premises, cars, etc.⁵), and robbery (in shops, exchange offices, petrol stations and other places where they expect a larger amount of money), and grand theft qualified by manner (usually tantamount handbags and mobile phones from persons who are not expecting it, or can provide strong resistance). The tertiary drug-related crimes or the merchants at the higher levels of drug markets will be more elaborated in the following chapters.

3. Relationship between the police and petty sellers and drugs consumers

The police in our present conditions is the institution whose activities are still of a repressive character primarily. Although the Law on police⁶ in the Art. 10, line 1, p. 3 speaks primarily about prevention and thereon about discovering and solving crimes and criminal offenses, this kind of policing is still not sufficiently emphasized. A drug-related crime is in the first row of the center of interests of Criminal Police's specialized services. Drug abuse, which some authors refer to as "the by-product of drug-related crime" (Modli, 2002) or negative social phenomenon, which stems from narcotics-related crime and has a retroactive effect to it in terms of security markets, still has a little attention by the police and is largely left to health and social workers. Despite all this, the

⁵ From the police practice in PS Novi Sad and PS of Belgrade city which are similar to the others, we can conclude that they include armed robberies committed by the knife, real or more often fake guns (replicas, which does not diminish the seriousness of a crime in question), and there were spotted cases of threatening with needle supposedly infected with AIDS.

⁶ The Police Law, Official Gazette of the Republic of Serbia, No. 101/05.

nature of the activity on both sides seems to multiply contacts between drug users and petty dealers on the one hand and the police on the other hand. They stem from the fact that the illegal drug trade is consensual, contractual relationship between a seller and a buyer, proving of which, for the police and other relevant stakeholders, implicates necessity to ensure the presence of both parties, i.e. both the buyer and the seller. As the last link in the chain of commerce, direct consumers' trading is at the lowest level and it is carried out daily and very widespread. Other grounds for the contact of the drug consumers and the police are the enforcement of criminal acts in the sphere of secondary narcotics-related crime, previously elaborated.

J. Bukelić is deducing about seller and buyer conjunction as a victimless "crime", in which they both benefit, as this type of crime is a rich, inexhaustible and creative model of criminal behavior (Bukelić, 1998). The correlation of the buyer and the seller leads to their apparent alliance, given that there are the joint ventures, the realization of common interests, and against anyone who can prevent it, especially the police. The interests of the seller (the so-called "Street-level trafficking" is also often a drug user) and the consumer for a successful job, and the fear of potential embarrassment that may result from the deprivation of liberty and of the future activities of police and judicial authorities, makes them particularly cautious, as the police imposed the task of continuous monitoring and introducing new modalities of street drug trafficking.⁷

Normally, the police approach information mining from drug consumers by bringing them in police premises, most often, after the act of buying and selling. The recent changes in criminal legislation resulted in the criminalization of possession of narcotics, so that by the previously mentioned act of purchase all the customers will find themselves in the criminal area, because of the purchase, i.e. factual possession of drugs presents committing a crime. This fact may represent an additional cohesive factor that strengthens the interdependence of the seller and the consumer in their joint venture, and opposed the prosecution. In larger urban areas depending on the buyer the seller has a relative character, because the extraordinary dynamism of the street drug market allows for supplying from several mutually independent sources.

It was stated previously that the subject of interest of the specialized police services are primarily drug-related crimes and their perpetrators involved in the sale at various levels. Within the context of drug-related crime consumer is in-

⁷ By the crime units praxis there are different ways of protecting by the criminals (street sellers) in case of arresting, i.e. placing the narcotics in certain places, and after obtaining money from the buyer then they explain where the drugs paid for are to be found; while selling in the apartment consumer is forced to consume immediately, so that it could not be found at him after leaving the apartment.

teresting for these services if he (or she) can provide information about vendors, methods of operation, possible sources of supply and trends in the local market. Data collected by the police about the drug abusers, their relationships with other persons from narcotics milieu and previous criminal activity can also be interesting, having in mind that due to the nature of his illness, every addict can become a seller very quickly. A street vendor, who can show to the police a person from whom he purchased drugs, is more interesting. However, in practice this rarely happens. Most small dealers face the objective circumstances and admit the execution of works, but do not indicate the supplier, partly out of fear of retaliation, and partly hoping to silence the police to gain some benefit by their employers. Appreciating the "good manners" in the police detention, higher levels of criminal structure can provide counsel in criminal proceedings and provide "business" after the release to freedom.

In contact with the police officers this person applies different ways of dealing. Less experienced consumers, with short user career, tend to self-assertive behaviour and seek to confirm or improve their place in drug user sub-cultures. Because of this they often resort to "hard" attitude while denying that they bought drugs from a person even when it is obvious that it was found on them and that after the act of purchase when the seller was brought in and with the money. Under some other circumstances they do not speak, and often negate the use of any drugs, although it is more than obvious in the present symptomatic picture. This is similar, with small dealers, particularly during the first detention. As already said, they are usually addicts, and thus everything that has been said about this category refers to them as well. Most resort to lies as a means of defense. Lie is a widespread form of communication in drug abuser population, which in the beginning usually has a defensive character, and later becomes functionally independent and often applied to new or unknown environment (Petrović, 2003).

More experienced abusers are often repeated criminals and have various attitudes towards Criminal Police – from being dozed in communication about the required information aiming to their generalization and avoiding specific names and events, to the fact that, deeply aware of their illness and situation are, in conversation finding some form of instant relief, agreeing to communicate in an informal chat revealing everything they know about the local market, offering sometimes even some forms of cooperation. However, users who have a more flexible attitude toward the police are aware that the new situation is only temporary and will soon be found in their usual environment where providing the information to the police or a possible collaboration is not looked on favourably. So, in their environment they deny any disclosure of information, while the proposed cooperation is often forgotten as soon as "they go around the corner".

4. Police and organized drug-related crimes

As already stated in the introductory considerations, the huge profits that an international drug trafficking is a decisive factor affecting the interest and involvement of criminal groups in this activity. Their relationship records for decades, so that in the literature have long been the traditional means. Criminal consortia involved in smuggling and drug trafficking are truly global, and the nationality of its members, and the scale of their operations (Legresley, 2003). These organizations may be organized as pyramid (like the Colombian cocaine cartel), or they can form criminal network, composed of a larger number of smaller horizontal groups to join together as needed, from regional to international level (Marinković, 2004). Nowadays, especially in Europe, another type of organization predominates. Production and sale of large scale drug indicated as the most common form of crime the criminal networks, aimed at whole Europe (CoE, 2006).

The fact that long way that drug goes over from manufacturer to consumer differentiated functions in the chain of smuggling and selling. Seen vertically, usually we think of importers, wholesalers, retailers and, finally, the small dealers. This division is only of broad character, because in practical activities of criminal drug organizations do not move from manufacturer to customer always through the same means and through the true number of persons with a previously defined function, as it is marked here. Criminal organizations are flexible and easily adapt to new circumstances, so it is difficult to determine the constants in this regard. In fact, in the case of smuggling and sales of those drugs where their physical properties permit, initial shipment, considered in absolute amount, loses quality, and gaining weight, rises the overall price.

Apart from this, vertical, there is a division of traders with respect of the motives for criminal activities of this kind. Thus, in one paper a group of distinguished authors (Dorn, Levi, King, 2005) distinct all traders as "political-military", "business criminals" and "adventurers". Political-military traders aim for restructuring political relationships, or achieving a dominant position within the existing political structure or the state, or decaying country. Business criminals, driven by the financial ideas and aspirations, are limited to their own quiet enjoyment of the profits that are realized illegally. They are not craving for general political change, but they can go for a limited corruption in a defensive purpose. Adventurers are indicated traders who are forced to be great risk exposed, because of their belief of non existing other solution (i.e. due to the debt, or extortion), or they may feel excitement, while not fully understanding the risk to which they are exposed to.

Actors of this kind of criminal activities are in a possession of characteristics that differentiate them in relation to other delinquents and qualify as a particularly socially dangerous (Đorđević, 2004). As a rule, they are intelligent, cunning, skilful

and very communicative people who never admit the crime, even when caught in action, with smuggled goods (Đorđević, 2004). The smugglers are always closely in monitoring the market situation and activities of the opposite side, police and its specialized agencies, also the activities of customs bodies. Unlike the employees of these agencies, who are working in the public interest, smugglers and drug dealers do not have that kind of comfort in acting, knowing that any mistake can lead to financial loss of the money invested and to the lack of expected earnings, with always present a risk of detention and closure, and the loss of all or most of the illegally acquired property. We could say that the domestic situation, but also in the market of Europe, mainly present is the type of business "criminal" who actively works to improve "working conditions", whether that it is a possibility of corruption of higher officers in police, customs, judiciary, or politics, or the implementation of technical improvements achieved by intensive technological development. They are constantly dealing with risk assessment and opportunities evaluation for the profits, and the relationship of these two factors most often presents the key element which guides while making decisions about job participation.

The supplying of drugs involves a wide range of personnel, from organized gross sale up to opportunistic criminals in selling small quantities of narcotics. This phenomenon requires a variety of multi-dimensional response (Browne, Mason and Murphy), which should include the fight against transnational organized criminal groups and containment strategies for narcotics based crime and narcotics trade demand at the national level. In each of the combat segments the police have an active role and especially in first two, we could say, it is crucial. Today there are various forms of public reaction to the problem of smuggling and drug trafficking, which range from a wide range of suppression of the smallest form of narcotics based crime up to the state association at the international level. Hence we can say that there are different levels of that activity. Transnational aspect is reflected in the activities of international or regional organizations and inter-state cooperation in specific cases of international drug trafficking, but also in the immediate intervention of global powers in the country of origin or of the finished products. National form consists in the fight against all forms of trafficking in drugs in one country, from street sales up to suppressing the activity of the highest levels of criminal organizations, including all measures aimed to reduce demand. The preamble of the UN Convention against illicit traffic in Narcotic drugs and psychotropic substances⁸ has been clearly perceived harmfulness of all activities of transnational criminal organi-

⁸ Adopted in Vienna in 1988. Ratified by Law (In Yugoslavia) 1990, Sl. list SFRJ – Međunarodni ugovori, br. 14/90. Other relevant international law acts are: The Single Convention on Narcotic Drugs from 1953. Ratified in 1964. (Sl. list SFRJ – Dodatak, broj 2/64) and The Convention on Psychotropic Substances from 1971. (Sl. list SFRJ, br. 40/73).

zations and concluded that the illegal trafficking and other organized criminal activities in the plan "undermine the legitimate economies and threaten the stability, security and sovereignty," and that the illegal operations present: "international criminal activity whose suppression requires immediate attention and the highest priority."

5. Conclusion

There is no doubt that there is a high degree of interdependence between drug abuse and crime, which is confirmed by the results of research showing the increased drug use among the arrested, the high level of criminal behaviour among drug users, and some degree of correlation between drug use and crime in the general population. Criminal acts related to drugs were recorded growth in many EU countries, while a high level of ordinary crime (70%) in some way linked to the use of narcotics. According to available data and experiences of domestic police, one could say that in this respect is not far behind the developed Western countries. Contacts of drug sellers at the lowest (street) level of sales with the police are very common, despite the obvious interdependence that exists between the population and consumers of narcotics and their mutual interest in such ventures to remain undiscovered. These contacts arise from the fact that trafficking in narcotics constant subject of interest of the police, especially its specialized agencies. In addition, these are persons who are called actors of "secondary" type of narcotics based crime. Their behavior in contact with the police may vary from total denial of connection with the purchase or sale of narcotics to dozed disclosure of relevant information or easy offering some form of cooperation. Unreliability of addicts, as an important personality trait, is the limiting factor of any serious cooperation. If we observe statistical indicators related to the number of crimes committed in this area, there can be spotted a smaller number of charges filed against the perpetrators of the organized form of sale of drugs (Art. 246th al. 2. of the Criminal Codex) and for enabling the crime of narcotic drugs (Art. 247th al. 2. of the Criminal Codex⁹), in relation to the basic form of criminal sale of unauthorized drugs. This discrepancy could be explained in the first case by insufficient human and technical resources necessary to detect and prove complex types of this crime, with the exception of several specialized units of the ministry, which in this respect is not lagging behind European standards. In the second case it is, in our opinion, the police are first focusing on the crimes of sale and on the quantity seized of psychoactive substances, while enabling the enjoyment of drug treated incidentally, along already discovered sales activity.

⁹ Criminal Codex of Republic Serbia, Sl. glasnik RS, br. 85/05, 87/05 i 115/05.

Organized narcotic-based crime is one of the greatest dangers to any democratic society. In the market of Europe, as well as in national frameworks, mainly present the so-called type of "business criminal", which is actively working "to improve working conditions", whether it is a possibility of corruption of holders of higher functions of the police, customs, judiciary, or politics, or the introduction of technical newspapers offered intensive technological development. The above circumstances in many ways stand out in comparison with other delinquents, and make the actors of this form of criminal activity particularly socially dangerous, especially when one bears in mind the constant increase of available capital that allows new ventures and the so-called criminal "trade influences", widespread in systems with under-developed institutions and with lack of rule of law. Because of this, the society's answer to the problem of narcotics based crime must be continuous, dynamic and multidisciplinary, with the constant repressive actions of the police and other relevant institutions and intensive application of measures focused on reducing demand psychoactive substances.

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NARKOMANIJA, POLICIJA I NARKOKRIMINAL

Rezime

Autori se u uvodnom delu rada bave razmatranjem problema narkomanije i narkokriminala kao sociopatološke pojave sa širokim dijapazonom kriminalnih konsekvenci i daju kratku genezu razvoja i pregled osnovnih uzroka široke rasprostranjenosti ove pojave u našem društvu. Zatim sledi razmatranje kohezivnih faktora narkomanije i kriminala (primarni, sekundarni i tercijarni narkokriminal), u kojem autori zaključuju da nesumnjivo postoji visok stepen međuzavisnosti između narkomanije i kriminala, što potvrđuju ranije sprovedena istraživanja, čiji rezultati govore o povećanoj upotrebi droga među uhapšenima, visokom nivou kriminalnog ponašanja među korisnicima droga, kao i velikom stepenu korelacije između korišćenja droga i kriminala u opštoj populaciji. Centralni deo rada posvećen je tipologiji i karakterizaciji lica iz sfere narkokriminala i njihovom odnosu prema policiji, kao jednom od subjekata koji aktivno učestvuje u suzbijanju ovog društvenog zla.

Summary

In the introductory part of the work the authors are addressing the problem of drug abuse and narcotics crime as sociopathological phenomenon with a wide range of criminal consequences, and they are, also, doing a brief overview of the genesis and development of the basic causes of the wide prevalence of this phenomenon in our society. Then there is a review of the drug addiction cohesive factors and crime (primary, secondary and tertiary narcotic-based crime), in which the authors conclude that there is undoubtedly a high degree of interdependence between drug abuse and crime, which confirms earlier research conducted, which results show the increased drug use among the arrested, a high level criminal behavior among drug users, and some degree of correlation between drug use and crime in the general population. The central part is devoted to the typology and characterization of persons in the sphere narcotics based crime and their relation to the police, as one of the entities that are actively involved in combating this social evil.

CRIMINAL INVESTIGATION PROCEDURE ON THE SCENES AND WITHIN THE CONDITIONS OF MASSIVE ACCIDENTS

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Abstract: Numerous and various events that are causing harmful consequences require the performance of numerous activities at the location of an event, bearing in mind the importance of their nature, causes, actors and other questions that are important in order to solve such cases, as well as large information potential of the scene of the event. Besides the measures such as help provided to injured persons, prevention of further destructive influence of causes of an event, remedy of consequences, etc., the important part within the procedures made on a scene of an event is the criminal investigation procedures, i.e. crime scene investigation. Complexity of such a procedure, besides the large number of specific and special actions, is the most visible within the conditions of massive accidents – emergency situations. In this paper the emphasize is on those circumstances that are mutual for the largest number of events that are following up those massive destructions and that are endangering life and health of large number of persons, and that have to be taken into consideration during the crime scene investigation procedures at the place where the accident has occurred, as well as the most significant features within the treatment of events of such kind.

Key words: scene of an event (scene of crime), crime scene investigation, massive accident, emergency situations.

1. Introduction

The variety, diversity and complexity of events that cause harmful effects, the importance of answers to questions about the nature of specific events, causes, actors, and several other important issues for its clarification, and a great

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informative potential of the place where the event occurred, requires taking a number of activities at that location. Besides the measures such as help provided to injured persons, prevention of further destructive influence of causes of an event, remedy of consequences, etc., the important part within the procedures made on a scene of an event is the criminal investigation procedures, i.e. crime scene investigation. This kind of procedures at the scene of an event assumes the existence of consequences, in the form of injury or endangerment of a property, which is the basis for suspicion that the case is in fact a criminal act. Often, with the measures and actions that are performed it will be determined that the event, which was the cause for suspicion that a criminal act was performed, has its cause in the force majeure, or it emanates from the case, so in connection with this event the question of criminal responsibility of its actors will not be raised. Of course, with this the importance of criminal investigation procedures performed on a scene of an event is not decreasing, but on the contrary.

The term place of criminal event, in the criminology literature, indicates the current place or the location where the incident occurred (Byrd, 1), e.g. the place on which the act was committed together with the entrance or exit (Weston & Weells, 1997). Referring to the institutions and concepts of criminal law, the place of the criminal event is defined as a place of execution, understood within the sense of criminal justice, and as any other site where you can find traces or items of some criminal act (Aleksić & Škulić, 2002), or as a place of execution of some actions and a place where there is an occurrence of consequences of an event that is the basis for the suspicion of a criminal act and any other place where there are items and traces suitable for proving criminal-justice relevant facts related to it. With the same meaning, within the criminal practitioners, the term scene of crime is much more in use.

Criminal and criminal-justice theory and practice are not divided when it comes to the significance of scene of crime investigation, which is understood as a system of measurements and actions with which, in accordance with legal and criminal regulations, and with the use of adequate scientific, professional and experienced methods and equipment we are able to secure, determine and document conditions on a place of some criminal event, and with that we directly determine the answers to the so-called golden questions of criminology, i.e. we are gathering evidence material and creating the facts' base that will enable all that. In the same time those gathered evidence must be acceptable, which before all means that they are found, secured, processed and stored in a professional manner (Weston & Weells, 1997).

Even though the activities within the crime scene investigation are various and complex (they mean the engagement of a large number of different subjects who are in charge of the performance of some of numerous tasks on complex

conditions at some crime scene), it can be said that in the practice the basic protocol for crime scene investigation is built and present and all should respect it in all situations. Basically, this protocol means the continuous performance of the following activities: securing crime scene, gathering information on a crime scene and crime scene investigation. Speaking about the same issue some authors distinguish the definition, that is, the determination of a crime scene, its documentation and evidence gathering (Byrd, 1). Often, the scene is a spatial framework for the execution of not only these, but numerous other criminal and criminal-procedure actions: demonstration, that is, recognition of a crime scene, reconstruction of events, interview of witnesses, situational and other expertise, criminal experiment, search and temporary seizure of items.

Bearing in mind the concrete objectives of the procedures performed on a crime scene, it can be said that the crime scene investigation means: undertaken within the measures of first intervention, i.e. right after the knowledge about some event is acquired for which there is a suspicion of being a criminal act; a continuous action and systematic performance of actions with which the following shall be done: a) to determine if the event in question is in fact a criminal act, and if it is, to determine its type and to make precise classification, if that is possible; b) to gather, and if necessary to forward (as a warning or as a call for search) the data about the individual characteristics of a perpetrator, possible accomplices, vehicles that they used, how and in which direction they left, etc.; c) to find, identify and interview victims, eyewitnesses and other persons who have the knowledge that is important for the full clarification of the specific event and then to document their statements; d) to secure crime scene, to look for, to find, to mark, to analyze, to interpret, to protect the items and traces from changes, disappearance, damage or contamination, and then to preserve the items and traces for which it is clear or it is assumed that those are the evidence; e) to determine the way and means used for the performance of that criminal act, as well as its nature and its consequences; f) to register the methods and means used for the search, development and for securing of evidence, i.e. the data about gathered evidence; g) to design investigation documentation. This procedure phase is, by some authors, called "preliminary investigation" and it is determined as the first phase of general investigation (Weston & Weells, 1997).

Because of the complexity and variety of concrete events, the mentioned phases of the protocol for crime scene investigation are mutually intertwined in different modalities. Despite this, the protocol is essentially, the same procedure for the crime scene investigation of any criminal act (Baldwin), from the most simple case to the most complex one, and designed approach to the implementation of the crime scene investigation means a series of assumptions,

responsibilities and procedures within the work performance of competent subjects: fast and uncompromising act upon the knowledge of the event; safe approach to the scene and its protection; achieving the preliminary determination of the crime scene boundaries; marking of the possible point of arrival/escape of the perpetrator from the crime scene; determination of the degree of crime scene protection that was done till that moment; protection and security of a crime scene; take control over the situation at the crime scene; establishment and preservation of official and emotional control on a crime scene; determination of the identity of persons who are present at the crime scene; gathering information from the persons present at the crime scene and who have some knowledge about relevant circumstances; prevention of unauthorized entrance to the area of a crime scene; registering data about the identity and reason of the entrance, i.e. exit of the person from the area of a crime scene; evaluation of possibilities for collection of material evidence; complete knowledge and correct usage of all necessary resources; use of adequate methods and techniques in the detection of evidence; thorough and lawful search conducted at a crime scene; detection of all relevant evidence with the full attention paid on discarded or hidden and planted evidence; marking, collecting and documenting material evidence; proper handling and packaging of evidence; proper documentation about the crime scene in general and particularly about important details; preparing and making the narrative description about the crime scene; photographing crime scene; preparation and design of sketches of a crime scene; selection of competent specialists - facilities for the analysis of evidence; implementation of the final crime scene review; leaving the crime scene; compiling extensive notes on all the observation and all that was done. (Byrd, 1; Crime Scene Response Guidelines, Organization and Procedures for Search Operations; Weston & Weells, 1997).

To denote different types of events that are accompanied by severe destructions, significant material damage, losses of human lives, or enhanced risks, members of different professions and services, as well as volunteers who participate in planning the defense from the existing dangers, are using different terms. Each term has distinctive associations. Persons working within the emergency intervention services prefer to use the term “large or great or massive accident”. Distinguishing it from the term accident, the term incident points out that that is an “avoid accident”.

Within the manual of the Secretariat for civil emergencies, from the Office of the Government of the United Kingdom, dedicated to dealing with disasters, it is accepted to use the term “massive accident” as a general term that can be applied to a large number of destructive changes, which are either on their beginning or they present disasters or crisis with current influence. For the purposes of this manual a large accident means every event or circumstance (which

happens with or without warning) that causes or threatens to cause death or injury cases, destruction of communities or causes damage to properties or surroundings with such strength that the consequences cannot be rehabilitated by the emergency intervention services, local authorities and other agencies and organizations as part of their normal everyday activities.

In other words, a large accident is every emergency situation which requires undertaking of specific activities by one or more emergency intervention services, and which generally includes the participation, directly or indirectly, of a large number of people (rescue and transport of a large number of victims; combined involvement of large police resources; fire-rescue and emergency medical services; mobilization and organization of intervention services and support services). Thus, for example, London coordination panel for emergency (LESLP) was formed in 1973 and it consists of the representatives of the Metropolitan Police Service, the City of London Police, British Traffic Police, London Fire Brigade, London medical emergency services and local authorities. There are also the representatives from London Port Authority (PLA), Naval Coastal Guard, the RAF, military and voluntary sector. If necessary, LESLP can invite representatives of other agencies to join the group, depending on the nature and type of incidents. Moreover, something that represents a big incident for one service does not have to be the same for another – for example, there are possible cases in which some services will be engaged only by putting them on standby (Office of the Government of the United Kingdom, the Secretariat for Civil Emergency Situations, 2001).

In the draft of the law on emergency situations and civil protection of the Republic of Serbia in June 2009, an emergency situation is defined as a situation in which the risks and threats or the consequences of natural disasters and other large accidents, special events and risks for population, environment and material goods are of such scope and intensity that their occurrence or consequences cannot be prevented or eliminated by regular activities of the competent authorities and services, so that is why for their reduction and elimination it is necessary to use special measures, forces and resources with enhanced working mode. Emergency situations, according to this law, are as well the consequences of war destruction and terrorism.

Characteristic elements, based on which the emergency situation (ES) can be classified are: the source and nature of emergency situation; spreading rate; the scope of emergency situation. Natural sources are dangerous natural phenomena; technical and technological breakdown and dangerous technical and technological events – (incidents, accidents); war – modern means of warfare; biological and social – particularly dangerous or widespread infectious diseases of people, domestic animals or plants.

In accordance with the spreading speed ES can be explosive, violent or moderate and slow (long). In the explosive, violent we could classify those that are caused by earthquakes, explosions, traffic accidents, destruction of buildings and facilities, as most of war conflicts. Strongly developed are also those ES caused by fires, catastrophic floods, accidents which occur during the discharge of hazardous chemical substances and use chemical weapons. Opposite of that, ES that develops in a moderate and slow way is associated with environmental pollution. Emergency situation caused by drought, soil contamination, breakdowns in industrial plants for purification are called “crawling” disasters.

In accordance with the scope ES can be of local, regional, national and global character. Emergency situations of the smallest scope, i.e. of the local character are events that do not spread beyond the borders of a settlement, company or facility. Endangering factors of regional, national and global crisis situations are affecting the entire region, country and planet Earth as a whole.

It can be considered that large accidents – emergency situations have four phases: initial response; consolidation phase; recovery phase and the establishment of normal conditions. Determination of the causes of accidents, including a conversation with persons who have intervened, can be done throughout this structure (LESLP, 2007). Terrorist acts in its essence and consequence also represent emergency situations.

2. First measures and risk assessment of the criminal procedures at a crime scene

A general rule is that the actions done by the police officer who arrives first to the crime scene, as well as the actions done by any other authorized official involved in its processing, should not be impulsive, rash and uncontrolled, but designed, calm and systematic. In some cases, especially in the case of massive accidents, that is not easily achieved, because with the basic objective, securing the scene, some other objectives must be harmonized, and before all the following: to prevent further spread of harmful consequences, i.e. to prevent occurrence of new damage (for example, prevention of secondary explosions and casualties within gathered curious people or members of different services who are performing crime scene investigation and who are providing aid) to help injured persons, to regulate the movement of people and vehicles in the narrow and broad area of that event, enabling the work of a variety of rescue services, prevention of removal or destruction of items and traces that are present at a crime scene and special protection of certain items and traces, arrest or direct chase of the perpetrator who was caught in the act or near the place of execution.

Specific issues of the processing of certain types of events can be recognized in some legal provisions. Thus, for example, the Law on traffic security (RS Official Gazette no. 41/09) provides the obligations for an authorized official who is undertaking the inspection to organize the list of assets that remain at a crime scene after the person who was involved in a car accident got killed or was seriously injured and to secure the same assets till the moment when the assets are taken over (Article 176). In addition, if after the accident, the driver or vehicle's owner, does not remove from the road, without any delay, the vehicle, cargo, items or other material scattered on the road, territorially competent organizational unit of the Ministry of the Interior shall order the road management to remove the vehicle, cargo, items or other material from the road to some safe place at the expense of the owner (Article 177).

The complexity and delicacy of work on crime scene investigation is reflected in the necessity of meeting with extremely traumatic situations that follow massive accidents. Among the most traumatic, of course, are those that result in the death of a person where that is particularly emphasized in the case of a sudden death of a child. A sudden loss of young and innocent life, devastating for the parents and close family of the child, does not leave indifferent even the authorized officials who work on the investigation of such death case. Although the authorized officials may have learned to channel the energy caused by some tragic event towards the determination of the truth, it is usually not possible to fully realize that (Byrd, 2). Stressing the importance of law enforcement measures, some authors emphasize that police officers who first arrive at the crime scene which resulted in a number of heavily injured and fatally injured persons they must resist the temptation to become personally involved in rescue operations. Their main function in this phase is to obtain and submit accurate information in order to assess and implement measures for the response to such disaster (International Criminal Police [Interpol], 1997).

Authorized officials who come to some crime scene can in any moment find themselves in potentially risky or dangerous situations. These situations or circumstances can sometimes be seen without any major problems, and sometimes intuitively but not at the first sight. Visible forms of risk and danger speak for themselves and the training and experience develop intuitive form of recognition. The crime scene that carries the risk of infection, or its parts where those risks are present should be specially marked by tape, flags or other signs that warn about the risk zone, or item, or traces (for example, do not approach there is the risk of infection, radioactive, etc.).

At massive accidents – ES, with a variety of risks of physical, chemical and biological nature, considerable attention should be given to the risks of radioactive radiation. Risks that are not easily noticeable certainly include viruses and

infectious substances, which occur especially in situations of contact with the remnants of a human body or contact with human blood and tissue in the area of injury or death. Diseases that are threatening the most from some crime scene are hepatitis B, tuberculosis and herpes. Besides those there are also other such as: viral hemorrhagic fever, Creutzfeldt-Jakob disease (mad cow disease), hepatitis A and E (carried through the feces), hepatitis B, C, D and G (serum hepatitis) for the transmission of which a direct contact is required (Czarnecki).

Experience has shown that the personal safety of the authorized officials and safety of other persons present at the crime scene is a priority, and respect of the fact about the existence of numerous risks of injury and infection in the area of massive accidents requires that, besides the definition of the necessary human and technical resources, before entering the area of a crime scene, one must provide protective equipment for the authorized officials who are engaged in investigation. Practice has shown that in most cases, when it comes to protective equipment, it is necessary to use rubber gloves, protective suits, protective shoe covers, aprons, face masks, protection for the eyes and face. Basically, there are four levels of protective clothing. The lowest level, coveralls without respirators, are used to protect a person from the mildest inconvenience of contamination, while the highest level involves wearing fully enclosed suits under which there is a breathing device. Other suits protect the skin, respiratory system and eyes (Byrd, 3). Efficient work with the use of suits (which are not especially flexible) and other equipment of the highest level of protection presupposes previous practical competence of the authorized officials developed through training and experience. Only then, therefore, in conditions of complete knowledge of the equipment that is at their disposal, it is possible to work in it, where every movement must be slow and cautious (Czarnecki).

The efficiency of undertaken protection measures includes the consistency in the application of properly selected equipment and awareness of existing risks and possible ways of contamination. This further means that wearing protective clothing, shoes, eye protection, gloves, etc., will not be enough for protection, if the contaminated pen, pencil or marker, used at the crime scene are placed behind the ears, if the caps from them are removed with the teeth, that is, if means for writing the notes, made and contaminated at the scene are brought to the official premises and thus become a source of infection. In the case of engagement in a biologically-risky situation, the authorized official, who is searching the place, should be allowed to say all his/her observations out loud to some other authorized official who does not have a direct contact with the items or substances that are the potential sources of infection. All items used for writing, sound recording and video taping should be used safely, and before leaving the crime scene, those items should be treated in the same way as with

the rubber gloves and other used biologically-risky equipment, i.e. those items should be disinfected on the spot, then disposed of in protective packaging and then disinfected or destroyed. When it comes to clothing used in place of some criminal event, that clothes should be separated from other clothes, till the contaminated clothes are clean. Those clothes will be decontaminated by washing them in water with bleach or detergent at a temperature of 135°C or more in duration of 10 minutes (Czarnecki).

Protection from risk means clear marking and decontamination of external parts of boxes in which the evidence from biologically-risky crime scene are packed, especially those that contain risky evidence. In this way, an authorized official who will later on get in contact with this kind of evidence shall be protected. Measures of precautions and protection should be consistently applied in laboratories where hazardous materials collected on a crime scene are delivered (Byrd, 3).

Specific problems and difficulties in the implementation of criminal investigation, and within that the crime scene investigation, are a link with the tragic events that had resulted in great loss of life and enormous material damage (accidents in air, roads, rails and naval traffic; accidents in mines; explosions; fires, etc.). Solutions for arising situations and acting in this, especially complex conditions involve not only teamwork but also the engagement of a large number of different teams. Cooperation between the teams, flexibility and ability of adjustment of engaged persons, are of crucial importance for the success of overall efforts to determine and repair the situation arising at the crime scene. Pursuant to what was said, behavior at the crime scene includes familiarization with available resources, establishment of management structure and system setup. One of the possible forms of management organization at the crime scene implies that the organization consists of: an officer responsible for personnel matters (that officer is located at the accident site and decides on the necessary manpower for the operation); an officer responsible for equipment and supplies (that officer should provide supplies and other field equipment and resources necessary for the safe and quick way to finish the operation); an officer responsible for the acquisition of food, water and other needed goods (that officer takes care that the manpower get those supplies); an officer in charge of the facilities (that officer should assign seats suitable for certain teams and services involved in rescue, as well as the place for nourishment, place for throwing litter, toilets, etc.); a liaison officer with the other teams; an operation officer for the allocation and coordination of operations; an officer in charge of public relations - communicates with the media that report about these types of events (Byrd, 4).

Delicate work on the sites of tragic events is the consequence of the fact that the work with the deceased, survivors and relatives often leads to unusually strong and unexpected pressures on the mind of engaged authorized officials.

Anyone who is involved in the work on the sites of massive accidents will experience stress to some degree. Vital issue for the success in overcoming the problem of stress is previously conducted training, quality preparation and properly informed personnel who are engaged. Equal importance has the information about individual opinions, reactions and conclusions regarding the occurrence, manifestations and consequences of stress. The collection, analysis and assessment of information on cases of stress should be performed by adequately educated and trained staff. Generally speaking, the importance of the recognition of stress as normal reactions to abnormal situations should not be underestimated. That is because its negative phenomenon, at some of the participants who have worked at a crime scene, may affect in a very harmful manner not only their mental health but also the success of the activities of the entire team. For easier preservation of emotional stability of the engaged personnel and control of situation, dealing with the feelings that are inevitably caused by the tragic events with a large number of fatalities and seriously injured persons, it is desirable to engage psychologists together with other members of the team for crime scene investigation. Stress can be reduced with the help of appropriate techniques, such as holidays, rotation of personnel, light exercises, etc. Selection of the most appropriate method depends on many circumstances and it must be made by the engaged psychologists (Interpol, 1997).

Considering that the tragic events which result in human casualties and great material destruction, require implementation of a long time, sometimes multi-day crime scene investigation, almost always in such situations, especially in localities outside of settlements (for example, in the case of aircraft in rough terrain - mountain range, swamps, etc.) numerous other problems are appearing: for example, the problem of transportation of authorized officials and other necessary personnel to and from the scene of an event (for this purpose, when conditions permit, it is possible to use helicopters); supplies of electricity for numerous devices (for this purpose it is necessary to provide electro generators); organization setup, storage and use computers and telecommunication equipment; needs for water, food, sleep, etc.; conducting physiological and hygienic needs for engaged personnel; waste disposal, etc. – it is necessary to set up more tents with a different purpose, prefabricated toilets, showers, etc. (Byrd, 4).

3. Securing crime scene

As part of the criminal investigation, securing of the crime scene begins with the arrival of the first authorized official to the site and it lasts until the moment when that site is left without police supervision. As a rule, uniformed police officers are those who are arriving first to the crime scene and then se-

cure it. The very process of securing the crime scene includes a series of inter-related activities: the determination of the width of the crime scene area, its marking, treatment of present persons, disabling effects of different disturbing factors and special protection of certain items and traces.

When defining the width of the area of some criminal event police officer acknowledges, before all, the spatial diffusion of visible items and traces of that event and the statements of present persons about the circumstances that are relevant for the specific situation. A very important prerequisite of successful work of an authorized official or a police officer and definition of crime scene boundaries is represented by his/her full intellectual engagement, analytical thinking and the possession of high criminal and other, in a given situation, necessary specialized knowledge and experience that enables high-quality observations, processing and evaluation of existing information, and thus the precise mental reconstruction of event's flow, on which the investigation is being made, including the definition of the spatial outline of that event. If the area of a crime scene is defined on too narrow an area, which does not include the routes that perpetrator used for arrival and departure to the crime scene, this will result in traceology deficit. From criminal practice it is known, that right on those places, attention of the perpetrator is becoming weak, on those places he/she rejects, loses or forgets certain items, leaving many traces that may allow his/her direct or indirect identification (Modly, 1999).

Areas where the items and traces are spreading and that should be found and secured during the investigation of massive accidents can be so large that it can hardly be imagined. Thus, for example in the case when an aircraft crashes from the high altitude, especially if there was a previous explosion in that aircraft in the air, the area where the items and traces are dispersed (parts of the wreckage, bodies and property of dead persons) can cover several square kilometers, geographically very diverse, which is not connected with roads and with hardly accessible terrain (Interpol, 1997). On such occasions, as well as in other similar situations, photos made from the air can be of great help in defining the width of the crime scene area. If the items and traces are scattered on rough terrain, it is necessary to divide the whole area into sectors based on natural or artificial features, such as river banks, fence rows, field roads, cliffs or buildings. These sectors can be further divided into smaller areas within which it is easier to work. Then a chart is prepared that corresponds to each sector, which clearly shows the coordinate system or the main fixed points, and a certain number of copies should be made in order to ensure that each of the places will be adequately investigated and that all relevant findings are precisely recorded.

The protection of the crime scene and items at it from theft, fire, explosion, flammable and other harmful substances (with the ban on entering the area to all

unauthorized persons) also means the end or initiation of interrupting supply or evaporation of dangerous substances, prevention of its further spreading and the end or initiation of electricity, etc. In such situations the boundaries of the crime scene area must be even wider and they should include the space where those poured liquids as well as other harmful substances are spreading, and it should also include the other potentially dangerous zones.

For easier managing of the situation in the area of massive accidents, it is recommended to set up three rows of protective barriers, and consequently, the differentiation between the three zones at the location where the event took place. Wider zone (external outline, external barricade) is defined and established as border and location that is wider than the crime scene and that is done in order to protect the site from harmful impacts. External barricade covers as much space as necessary in order to enable the prevention of access of undesirable persons and to provide safe presence of observers, media and official support staff, to provide space for the retention of the participants of that events, witnesses and potential witnesses, and to create conditions for the undisturbed and safe work of investigative team (Gavrilović, 1981). As for other barriers (zones), one indicates and isolates the command post (in a safe space, close to site), and the other indicates center or just the place where the event occurred and on which there are relevant items and traces (Byrd, 1). Command post, i.e. safe space - a quiet area, should be established, especially if the crime scene encompasses a broader space, or, however, more mutually (more or less) remote locations, and that post should be on the location that is considered to be the main one - the central location. That space can be used for: leaving the necessary equipment; stationary for personnel when they have a break during the work; as a center for collecting and processing data, conducting the necessary consultations with engaged personnel, making decisions and giving instructions to other participants in the implementation of the criminal investigation on the main site, i.e. coordination of work of teams at other locations that are included in the same criminal investigation; as a communication center; place for press conferences, etc.

One of the reasons for establishing a command post, when it comes to crime scene investigation of the places of massive accidents (requires more time engagement of the larger number of authorized officials), lies in the fact that consumption of food, drinks, smoking and unnecessary retention within the scene, with the danger for the evidence, can be detrimental to the authorized officials who, since they come in contact with different, often very harmful substances and if those substances get into their organism (through drinks, food and by hands) can seriously damage their health. For purposes of carrying out the numerous activities and the compulsory presence of a larger number of persons,

those involved in crime scene investigation, as well as the other persons, it is best to place a command post outside the narrow location of the crime scene area. That post can sometimes be placed not only outside the area that is determined as the crime scene area but on a more distant place in relation to that area (of course with the existence of high-quality communication with the authorized officials who are directly involved in crime scene investigation). That is why in the function of the command post one can find a vehicle, tent, some local office, hotel room, etc. (Byrd, 1). Marking of defined boundaries of a crime scene in a given environment is done with the use of suitable objects and items, with the placement of authorized officials and/or vehicles, or with the placement of provisional means and/or means that are made for such purposes (ropes, tapes, special - regular or rotating lamps barriers, skittles), with clear messages about the police presence (stop police, do not approach - investigation in progress, etc.).

In the conditions of the compulsory presence of a larger number of authorized officials at the crime scene, the problem of its protection from uncontrolled movements and activities of other present officers is a problem that occurs on a regular basis. Besides the obvious psychological barrier (Bojanić & Korajlić, 2003) with the placement of police officers, the prevention of entrance for unauthorized persons that could move, damage or destroy evidence shall be made physically as well. It is particularly important to prevent changes that would diminish the significance of certain items and traces or that could contribute to their incorrect analysis, and thus the wrong interpretation of the event in general (Lipovac, 2000). As one of the solutions, which the authorized officials will use to deter unnecessary entry into the crime scene area, is the determination of only one entrance/exit at the scene and placement of a police officer at that place with the task to record the details of all persons who enter or leave the crime scene area (Interpol, 1997). If necessary, that police officer shall warn persons who enter the crime scene area that they could damage or even destroy some of relevant items or traces, and to inform them that the reason their names are recorded is that in case of a need police may ask them to give their fingerprints, shoeprints, textile fibers, blood, saliva, hair, etc. This will sometimes discourage the curious from among the authorized officials whose presence at the crime scene is not within the function of criminal investigation. The police officer appointed to an established entrance, as well as every other police officer who is engaged in securing the crime scene shall prevent other uninvited persons from entering the protected area.

The practice has shown that human curiosity, stubbornness, and sometimes stupidity and primitivism are much more “productive” in the final destruction of the holders of important information than the usual “disturbing”, informative - destructive factors, such as: atmospheric conditions, which generally fall within

the domain of God or the coincidence (Škulić, 1998). Explicitly forbidding the access to the uninvited persons, even if those persons are their immediate supervisor or officials from various levels of government and management, both vertically and horizontally, with their own example the managers of crime scene investigators will influence other authorized officials who are engaged at the crime scene (Garisson, 1994). If there is a need of entrance for some unofficial or official persons who do not participate in crime scene investigation, an authorized official should be determined who will direct them and who will monitor their movements and behavior, and be responsible for the preservation and security of the current state of the part of the crime scene on which those persons had access. This will prevent accidental or intentional damage, destruction or an alteration of the existing material evidence as well as the production of new material evidence (Schiro).

In situations where it is necessary, before the arrival of crime scene investigators, to enter the crime scene area (for example, to assist the injured person found at the scene, his/her transport to the health facilities, to cover the body of a deceased person, or to take other measures aimed at the immediate protection of human life and property), the authorized official person who performs the security, or guidance and supervision duty over the conduct of persons who were, for some justifiable reason, allowed to enter the crime scene area, must do everything to avoid unnecessary changes in the current situation, or damage and destruction of items and traces that can be used as evidence. In closed spaces particular attention should be paid to the floor as the place where most evidence can be found and which are, considering the location, exposed to the highest risk of damage and destruction (Schiro).

Besides all that was mentioned, the obligations of an authorized official is to remember, i.e. to highlight and secure the changes that were caused in an adequate manner (for example, by photographic or video recording of the found situation, by marking the found and place of transported person or corpse, the position of front and rear axles of vehicle, etc.). In order to prevent accidental destruction of especially important and not so easily observable items and traces, some of them should be clearly marked already in this phase of investigation - marked or otherwise protected (Lipovac, 2000). If there is danger of destruction of certain evidence, or the occurrence of changes that may reduce the evidentiary significance of certain items and traces because of rain, snow, wind, strong sun, the uncontrolled spread of water, fire, gas, etc., the authorized official who is securing the crime scene shall try to make special protection of such items or traces in the place where they were found, taking into account the already mentioned ways of how the persons can enter the crime scene (Vodinić, 1984). Authorized officials who are arriving later to the crime scene as

managers of the entire crime scene investigation or some of its parts must be informed about all that was noticed and undertaken till that moment, in the spatial and in functional sense as well.

Harmonization of different investigative teams, formed within a single crime scene investigation team, and in particular, different crime scene investigation teams formed for the investigation of one massive accident, implies the existence of a coordinator of all crime scene activities, a coordinator of criminal conduct, the formation of the group which consists of the managers of all teams formed for the work on crime scene investigation or its individual segments, and accurate recording of details about all members of the teams and their specific responsibilities (Interpol, 1997). In such situations, and in the search of crime scene area in order to recognize, that is to find the evidence, as well as labeling, development, securing and packaging of evidence, access should be extremely professional, thoughtful and patient, while, practical actions of finding and recognition of evidence should be followed by adequate documentation of the situation, the conditions and position in which they were found (with the careful making of notes, as accurate as possible, and with precise measuring of the essential elements and making the high quality and complete photo documentation). Even though one can find hundreds of different items and traces at a crime scene, all of those should be processed and analyzed. The question is, however, whether each individual item or trace can and should be marked, and then secured within the crime scene investigation documentation. That would be very laborious, time consuming and not always fruitful work. Thus, already in this investigation stage, the manager of the crime scene investigation and the expert for processing of traces are necessarily deciding about the issue of what will be important for a comprehensive and reliable analysis of accidents and they are selecting the items and traces with which the most important elements of the current situation will be documented and they ignore those that do not provide any new information about the accident (Lipovac, 2000, INTERPOL, 1997). Thus, for example, when marking the bodies of those who were killed in the criminal event that resulted with a larger number of dead persons (severe traffic accident in passenger traffic), they will use the pegs with boards on which there are marks (numbers) which should be placed in/on the ground next to the body, and do not move them, even after the removal of the body. Bags, in which the bodies are transported, should also be marked with the same labels (numbers), and assigned label will remain the reference for the body and it will remain with the body during the whole procedure of identification. A similar, but separate system of numbering must be applied when it comes to material evidence and property of victims (Interpol, 1997).

4. Conclusion

Aware of the fact that the characteristics of procedures (work and activities) at the scene of some massive accident, i.e. of extraordinary situations are numerous, and that only some of them, in terms of restrictions and the title of a defined paper content, are presented on this occasion, the authors recognize the professional obligation to take specific coordinated behavior at the scene of some ES as those that are connected to the crime scene investigation, as well as those that involve the engagement of other agencies and individuals of different specialties, and to discuss about all that in the new scientific and professional papers. By the logic of things, this means engagement, joint work and joint authorship with experts of various specialties.

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KRIMINALISTIČKO POSTUPANJE NA MESTU DOGAĐAJA U USLOVIMA VELIKIH AKCIDENATA

Rezime

Brojni i raznovrsni događaji koji uzrokuju štetne posledice, važnost odgovora o njihovoj prirodi, uzrocima, akterima i nizu drugih pitanja značajnih za njihovo rasvetljavanje, i veliki informativni potencijal mesta događanja, nalažu preduzimanje brojnih aktivnosti na toj lokaciji. Uz mere, kao što su pružanje pomoći povređenim licima, sprečavanje daljeg štetnog dejstva uzročnika događaja, saniranje posledica i sl., značajno mesto u postupanju na mestu događaja ima i kriminalističko postupanje, to jest kriminalistička obrada mesta događaja. Složenost postupanja, uz brojne specifičnosti naročito dolazi do izražaja u uslovima velikih akcidenata – vanrednih situacija. U ovom radu pažnja će biti posvećena onim okolnostima koje su zajedničke najvećem broju događaja koje prate masovna razaranja i opasnost po život i zdravlje većeg broja ljudi, a koje se moraju uvažavati i prilikom kriminalističke obrade mesta na kom se tragični događaj desio, kao i najznačajnijim osobenostima u postupanju povodom događaje ove vrste.

Summary

Numerous and various events that are causing harmful consequences require the performance of numerous activities at the location of an event, bearing in mind the importance of their nature, causes, actors and other questions that are important in order to solve such cases, as well as large information potential of the scene of the event. Besides the measures such as help provided to injured persons, prevention of further destructive influence of causes of an event, remedy of consequences, etc., the important part within the procedures made on a scene of an event is the criminal investigation proce-

dures, i.e. crime scene investigation. Complexity of such a procedure, besides the large number of specific and special actions, is the most visible within the conditions of massive accidents – emergency situations. In this paper the emphasize is on those circumstances that are mutual for the largest number of events that are following up those massive destructions and that are endangering life and health of large number of persons, and that have to be taken into consideration during the crime scene investigation procedures at the place where the accident has occurred, as well as the most significant features within the treatment of events of such kind.

COUNTER TERRORIST LEGISLATION, INTELLIGENCE AND SECURITY AGENCIES AND HUMAN RIGHTS

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Abstract: The paper discusses the nature and characteristics of counterterrorist legislation and focuses in particular on the influence of some of its provisions on the work of security intelligence services and their role in the protection of human rights and freedoms. Solutions contained in the so-called counterterrorist legislation have significantly changed and expanded to a great extent the scope of operations, jurisdiction and methods of security intelligence agencies in such a way as to effect more efficient combating of terrorism on the one hand, but also so as to question the justification of these solutions, especially from the aspect of the existing international standards for the protection of fundamental civil rights and freedoms. The rather heated debate does not appear to be calming down and it is particularly intensive with respect to the nature and scope of legal powers vested in the security intelligence services, their justification and possible threat to civil rights and liberties.

Key Words: counterterrorist legislation, security intelligence services, human rights and freedoms, control, lawfulness

1. Introduction

Contemporary threats and challenges to security exert significant influence on the position and roles of all subjects of the national security systems of each state. One of such challenges and threats is the appearance of the so-called global terrorism. The battle against terrorism is fought in a number of fields, one of them being the adjustment of legal norms so as to enable more efficient combat against terrorism. Following in the wake of the terrorist attacks in the

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US on September 11, 2001, numerous legal acts have been passed with a general purpose to redefine the existing legislative solutions governing the most important issues related to security and intelligence agencies and police. These changes were particularly extensive in the US, Great Britain, and Australia, as the states in which modifications of the national legislation took a distinct turn towards thorough changes in the strategy of national and internal security.

2. Recent changes in the counterterrorist legislations of the US, Great Britain and Australia

Based on *The National Security Strategy*, *The National Strategy for Homeland Security* and *The National Strategy for Combating Terrorism*, the central part of the US counterterrorist legislation presents *US Patriot Act – Uniting and Strengthenin America by Providing Appropriate Tools Required to Intercept and Obstuct Terrorism – P.L.107-56*, signed by the former US President George Bush on 26th October, 2001 (Uniting and Strengthenin America by Providing Appropriate Tools Required to Intercept and Obstuct Terrorism 2009)¹. Beside the Patriot Act, vitally important for prevention of terrorism in the US is the *Homeland Security Act* from 2002, as well as a range of other statutes that define measures and means of terrorism prevention in different spheres (transportation, health system, defence, etc.). The *Intelligence Reform and Terrorism Prevention Act* from 2004 is of great importance because it accurately outlines and offers innovative solutions with respect to 1978 *Foreign Intelligence Surveillance Act*. It broadens the investigative measures performed by security intelligence agencies with a view to provide national security and combat terrorism.

The Patriot Act served as legal grounds upon which the US institutions of executive power have significantly stepped up their operative strategies in the prevention of terrorism, especially in the US territory. For instance, the US Department of Justice, whose major task is the prevention of future terrorist acts against the US, concluded that the Patriot Act has a crucial role in the protection of Americans against terrorism. Basically, the Act is a more extensive and more strict version of the *Anti-Terrorism and Effective Death Penalty Act of 1996, P.L. 104-132*, which served the United States as means of legalizing the policy of intimidation and punishing the states which sponsor terrorism and through which the new legal category was introduced – *Foreign Terrorist Or-*

¹ For the US Department of Justice whose major task is the prevention of future terrorist acts against the US, the Patriot Act has had a crucial role in the protection of Americans against terrorism (Bullock, at all, 2006)

ganizations/FTOs; the act prohibits financing such organizations, granting visas to their members or providing any other type of material assistance, and it also rehabilitated the death penalty (Perl, 2003). Speaking of the Patriot Act, from the point of view of analysis of investigative and criminal procedural actions related to uncovering and prosecution of persons suspected of having committed acts of terrorism, Chapter 10 is of particular importance, because it defines 146 various acts which facilitate the work of federal investigative organs and judicial bodies in preventing and detecting terrorist activity (Bullock at all, *ibid*).

Soon after it was passed, the patriot Act faced numerous criticisms, especially in its Chapter 2 which deals with measures of surveillance and possibilities for mutual exchange of gathered intelligence among the judicial system bodies which, at that, need not be relevant for the criminal proceedings. Doubts were voiced most loudly with reference to the extended powers of American security intelligence agencies (members of the 'intelligence community') providing for surveillance of the US citizens (White, 2006). The Act allowed arbitrary detention of immigrants, secret search of premises, wherein the law enforcement officials could search the premises in the absence of the owner or his awareness thereof, and it also leads to the increased use of the so-called *National Security Letters*² against US citizens and foreigners even where there is no reasonable doubt that they have committed the specific criminal act.³

Most criticisms of the Patriot Act came from the non-government sector and primarily concerned the below listed powers entrusted to FBI by this statute:

- Control of the Internet traffic (web page analysis and e-mail control) and other communications on the basis of a secret court warrant against all persons that have ever been suspected of terrorism for whatever reason;
- Interrogating persons without court warrants purely on the basis of indications that they may have connections with terrorists or that they assist terrorist either materially or in any other way;
- Entering private premises (apartments or offices) on the basis of secret warrants and secret search thereof, as well as taking away document of persons for whom there are indications that they may have connection with terrorism or other forms of serious crime;
- Detention of immigrants and foreigners who can be charged with violation of the Immigration Act and Visa Regimen. In the case of the decision of

² *National Security Letters* are a type of orders issued by the FBI in order to gather information from private subjects for the purpose of criminal prosecution. They were introduced in 1978 and normally require the existence of reasonable doubt and are subject to court supervision.

³ For the analysis of the Patriot Act see: <http://www.ratical.org/ratville/CAH/USAPA.html#PAanalysis>

deportation, if the native states refuse to let such a person back in, such a person may be kept in detention endlessly, or for as long as the investigative organs (the FBI, e.g.) find it fit.⁴

General conclusion of expert audience and human rights organizations is that the Patriot Act presents unbelievable ignoring of federal law. Criticisms essentially concern powers that the Patriot Act gives to the investigative and criminal justice organs in the US, the exercising of which violates fundamental human rights and freedoms, most of all the right to freedom of speech and confession, right to privacy, right to a defence counsel in the course of a legal proceeding, the right to equal protection before the law, protecting from arbitrary investigations and arrests, etc. (Bullock at all, *ibid*).

Other counterterrorist acts passed by the US legislation have also shared the fate of the Patriot Act. As early as November 2001, the US president issues *Military Order*, which envisages treatment of foreigners considered to be members of (*Al-Qaeda* or to be otherwise engaged in terrorist activities. The act provides for detention of foreigners in facilities outside the US territory, who are court marshaled without any guaranteed of basic rights, envisaged not only international law, but also US law (non-existence of *habeas corpus* and other rights and procedural guarantees for the suspects). This practice was additionally reinforced by the *Military Commissions Act* of 2006, which more closely defined the jurisdiction of military commissions trying cases against *alien unlawful enemy combatants*, whereas the trial of US citizens remained within the jurisdiction of regular courts. However, experts have warned that deprivation of liberty (arrest and detention) of persons who live outside the US or who are not US citizens in any other way (by means of abduction or illegal transportation) apart from extradition or arrangement with the country concerned, can hamper international relations between the US and other countries and even jeopardize interests that are more significant than the interests of justice and prosecution of individuals (Perl, *ibid*). Example of such practices are abundant, ranging from prisons in Afghanistan in the period of US intervention and later, to Guantanamo, and criticism mostly concerns the treatment of prisoners accused of being members of global terrorist networks or their assistants (Chaskalson, 2008).

Non-existence of basic defence rights provoked a reaction of the US Supreme Court. Thus in the *Hamdan v. Rumsfeld* case, the Supreme Court took a stand that was highly critical of the regulations pertaining to work of military

⁴ Compare: Patriot Act Perspective – (The American Civil Liberties Union/ACLU Files against Patriot Act, From Kevin Bohn, CNN Washington Bureau, July 30, 2003. – In: Jane A. Bullock, at all, *ibid*)

commissions, emphasizing that proceedings before the Military Commission present violation of Section 3 of the *Geneva Conventions*, which provides for the minimum of standards for trials of prisoners taken in armed conflicts, as well as for their right to be tried before regular courts and granted all legal guarantees recognized among civilized nations (*ibidem*).

As far as the United Kingdom is concerned, its counterterrorist legislation consists of a number of more prominent acts: *Terrorism Act 2000*, *Anti-terrorism, Crime and Security Act 2001*, *Prevention of Terrorism Act 2005*, and *Terrorism Act 2006*. Other important documents include *Countering International Terrorism: the United Kingdom's Strategy* of 2006 and *Counter-Terrorism Bill 2008* (for more detail, see Berriew&Carlile, 2008). As for the role of the UK's Ministry of the Interior in combating terrorism, the above listed acts and documents define MI5 as the security agency primarily responsible for combating terrorism in the UK territory, together with MI6, GCHQ and the *Joint Terrorism Analysis Centre – JTAC*. They are obliged to protect British interests, resources and British subjects from this global threat in keeping with the existing legislation.⁵ An analysis of Britain's counterterrorist acts shows that security agencies were entrusted with significantly expanded powers with respect to investigation, detention and treatment of suspects in terrorist cases and other criminal acts related with it. Hence criticism of British counterterrorist legislation mostly concern the broad definition of terrorism, which includes even situations in which verbal support is offered to the armed resistance against the regime, and applies even to those who organize mass rallies as a form of protest against the government. The debate was especially heated with respect to provisions of Terrorism Acts 2000 and 2006, which substantially broadened the powers of security agencies (Hammerton, 2008).

Similar situations occurred in other states that passed counterterrorist statutes. In Australia, the key role in the prevention and suppression of terrorism was assigned to *Australian Security Intelligence Organisation – ASIO*. Namely, ASIO is in charge of realization of activities defined in the *National Counter-Terrorism Plan* and a new set of acts which deal with suppression of global terrorism. These statutes, as well as ASIO Act of 2002, granted ASIO broader powers related to forced entry, surveillance, storage of data pertaining to terrorist activities, search of premises, control of mail, tapping and recording telephone calls, intercepting electronic mail, control of computer data, secret surveillance of persons and the use of tracking devices on their vehicles, detention

⁵ Compare: *Countering International Terrorism: The United Kingdom's Strategy*, July 2006, the Internet 10/09/2008, www.intelligence.gov.uk/agencies/~media/assets/www.intelligence.gov.uk/countering%20pdf.ashx.

for 48 hours without reasonable doubt that they have committed acts of terrorism, including children, and the power to interrogate persons in the absence of their legal counsels. These provisions have turned ASIO into an agency of law enforcement in the sphere of suppressing „politically motivated violence“, especially terrorism (Bajagić, 2008). However, as in the case of the US and its security services, Australian counterterrorist legislation, and primarily provisions of the 2005 Anti-Terrorism Act, as well as measures envisaged for Australian security intelligence agencies following September 11 were severely criticized by Janny Hocking. The criticism mostly concerns detention of persons for 48 hours and their interrogation in the absence of legal counsels. For instance, power of detention involves abolition of a person's right to remain silent, that is, to refuse to answer certain questions during detention and in the absence of the legal counsel. Hocking warns that the government proposed the establishment of new categories of terrorist offences, based on the British Counter-Terrorist Act 2000, and suggested that the persons suspected of being members of terrorist organizations should be deprived of their property. Finally, the government outlined extensive and unprecedented powers for the state prosecutor or another delegated minister to ban or prosecute by means of declaration and without a court trial such organizations as the minister himself may find threatening to the security. This process of executive prohibition will then create new related offences, such as membership in and support of such organizations and these will be treated as criminal offence (Hocking, 2003).

3. Critical Survey of Some Provisions of Counterterrorist Legislation and Their Practical Implementation

Changes in the strategy of national security were somewhat expected, bearing in mind the devastating effects of the terrorist attack on the US and the fact that the methods of perpetration, motives, consequences and goals of this terrorist attack gave a new dimension and meaning to contemporary terrorism and made it a global phenomenon. Provisions of the so-called counterterrorist legislation have to a great extent modified and widened the scope of operation, jurisdiction and methods of intelligence and security agencies in a way which, on the one hand, promotes more efficient combating of terrorism, but, on the other hand, questions the justification of such provisions, especially for the aspect of the existing international standards related to protection of fundamental civil rights and freedoms. The ensuing heated debate does not appear to be calming down and it is particularly intensive with respect to the nature and scope of legal powers vested in the security intelligence services, their justification and possible threat to civil rights and liberties.

Numerous criticisms that were addressed to some of the solutions in the anti-terrorist legislation primarily pointed out that the implementation of such provisions had initiated the practice of seriously eroding the basic rights and freedoms and the practice of giving priority to national security in such a way as to make the requirement for consistent protection and respect of basic civil rights and freedoms appear relative. On the other hand, another danger of such practices was noticed, and that is a latent need to regard such a state of affairs as normal. In other words, there is a tendency to legalize arbitrary actions of security services and police that is to turn their extensive legal powers, introduced with a general purpose to efficiently oppose the current terrorist threat, into a model for future practice of security intelligence agencies. The critics of counterterrorist legislation draw our attention to the fact that even new terminology is used to that effect (resembling Orwell's 'newspeak'), thus giving new names to certain measures which, from the point of view of international law are undoubtedly unacceptable, so as to conceal their true nature. Thus, for example, kidnapping becomes '*extraordinary rendition*', whereas the use of torture, cruelty and inhumane treatment is referred to as '*coercive interrogation*'.⁶ Furthermore, the conflict with terrorism becomes a war, leading to the use of corresponding terminology. The war against terrorism, according to Chaskalson, was conceived not only as a war against nations, but also against organizations or persons considered to be the enemy. There are two concepts of war: one against a nation and the other against terrorists. No state or terrorist were specified. The entire world is a potential battlefield (Chaskalson, *ibid*). Besides, it was pointed out that most of these acts were typically passed in exceptionally short periods of time, without the necessary debate that should have preceded them and bypassing the gradual lawmaking procedures (Haubrich, 2003).

Numerous scholarly and scientific debates among authors have also provided a pretty clear picture of the essential problem stemming from specific solutions provided for in the anti-terrorist legislation. For instance, P.A.J. Waddington has emphasized that criticisms offered by liberal authors and advocates of civil rights frequently lacks firm grounds, that their fear of counterterrorist legislation is ungrounded, and that their pessimism is inspired by potential danger, and not actual practice. Besides, according to him, civil liberties were violated on a number of occasions in the past due to the need that states respond with more repression to various threats, but that did not lead to serious jeopardizing of basic rights and freedoms that would derive from nor-

⁶ This was the topic dealt with at the International Conference on the Rule of Law held in Chicago in 2006 (see, Robinson, 2006)

malization of such practices (Waddington, 2005). Waddington's claim that experiences from the past inspire optimism is, however, based on an analysis of experiences limited to the phenomenon of the so-called domestic terrorism. Contemporary societies, according to Dirk Haubrich, are facing a new phenomenon, the so-called transnational terrorism. The terrorist attacks of September 11 present the first case of transnational terrorism in which a state was attacked by non-state subjects. Aims of this form of terrorism are clear. They involve mass destruction, large numbers of civilian casualties and spreading fear (Haubrich, 2006). The reaction of some states to the outburst of transnational terrorism was very fast and thus adversely influenced the existing practice of civil rights and freedoms protection. The adoption of numerous regulations related to counterterrorist activities lead to a very realistic threat, not a latent one, according to Waddington, affecting fundamental civil rights and freedoms. Besides, the implementation of such provisions in practice gave devastating results. Haubrich gives alarming information that in the 2001 – 2005 period, 895 persons were arrested on the basis of suspicion that they were connected with terrorism or terrorist organizations. Out of this number, only 23 were convicted, whereas 496 were set free with no charges against them (Ibid).

Violation of international standards in the sphere of protection of basic rights and freedoms has thus become practice brought about by certain provisions of counterterrorist acts, which has been confirmed by examples given by many authors, including the one offered by Haubrich. It suffices to be reminded of the shocking video recordings of the US soldiers torturing prisoners in Abu Ghraib in Iraq, showing utterly inhumane and inhuman cruelty and ill treatment. Comparatively mild reaction of the US authorities following the publication of these recordings (suspension of the soldiers involved in torturing the prisoners) did not give an impression of determination to oppose such practices in an adequate manner. Furthermore, numerous decisions of the US president, as well as those made by the most senior representatives of political and military establishment, directly encouraged the practice of coercive interrogation and denial of obligations imposed by international law, thus supporting the practice an extreme instance of which was manifested in the torture used against the inmate of the Abu Ghraib prison (Paust, 2007).

Legitimacy of counterterrorist legislation was not questioned only because of obvious violations of international law norms protecting civil rights and freedoms. Its legitimacy can also be considered questionable with respect to its efficiency in combating terrorism. In other words, with respect to its basic motive, the reason and purpose of adopting such counterterrorist acts. This leads us to the military base of Guantanamo in Cuba and the practice of Bush administra-

tion in this facility which gave rise to a lot of criticism, controversies and debates. It is a common knowledge that the US authorities have turned this military camp into a detention center for aliens arrested under suspicion of being connected with terrorism. Over the past few years, during Bush's 'war against terrorism', a little more than 800 people were detained in this camp. The practice of the US authorities confirmed the absence of the prisoners' elementary rights (no right to defence, absence of *habeas corpus* and other procedural rights and guarantees), the use of torture, inhumane and degrading treatment of the prisoners and absence of time limits for their detention without pressing charges upon them. Such measures are not only seen by many as disputable from the points of view of ethics and international legal norms that prohibit such conduct, but also from the point of view of the efficiency of their use. According to Foley, the US policy applied in Guantanamo (and in other detention camps) has basically been completely inefficient because, due to the guidelines that it was based upon, it ended up with a too extensive definition of terrorism and lead to inhumane treatment in the course of investigation and forced confessions on the basis of which many innocent people were detained, and the very investigation of terrorist threat rendered utterly imprecise (Foley, 2008). The rules were not introduced to prevent abuse, torture and inhuman treatment. On the contrary, such practices derived from these rules and were encouraged, so it became the very purpose of the Guantanamo camp to ensure that the detainees are kept as far as possible from all the principles underlying the rule of law, as far as possible from any legal protection, at the mercy of the victorious arbiters (Lord Steyn, 2003). Some optimistic feeling, however, stem from the fact that one of President Barac Obama's first decisions in January 2009 was to close down the Guantanamo base.⁷

4. Conclusion

It is a fact that states, in an attempt to efficiently oppose terrorism by modern and acceptable strategies, both politically and legally, often have to face two conflicting goals of combating terrorism: 1) to protect citizens against terrorist actions, which implies limiting freedoms of terrorist organizations, groups and individual terrorists and enabling the state organs to work within law; and 2) to

⁷ The decision ruled that detaining people in the Guantanamo military base was contrary to the principles and values underlying the American society, and speaking about his decision to close down the camp Obama pointed out that the US would be efficient in combating terrorism, but only in the manner that complies with these values and principles. See: <http://www.guardian.co.uk/world/2009/jan/22/hillary-clinton-diplomatic-foreign-policy>; For decision, see: http://image.guardian.co.uk/sysfiles/Guardian/documents/2009/01/22/draft_order_closure_of_guantanamo_bay.pdf

ensure the maximum of democracy, human rights and freedoms while lawfully exercising power (Perl, *ibid*). This is where some justified criticism comes from with respect to certain counterterrorist acts in some states. Namely, we cannot help worrying about provisions contained in some of these acts and the ensuing practices. It is perfectly clear that a state has to defend itself from terrorism and the threats it poses. There can be no doubt about it. However, the way in which some countries want to oppose this threat inevitably gives rise to the question whether an overtly free interpretation of the need for efficient response to terrorism conceals possibilities for extending the powers of security and intelligence agencies in a way that seriously jeopardizes civil rights and freedoms both at present and in future? Based on the above stated, it can be concluded that this fear is quite realistic. The fact that leading political and economic powers were the first ones to introduce such practices is of particular concern. Paradoxically, these are the very democracies in which there is traditionally the rule of law. What appears to be certain is that the term terrorism used in rhetoric of some politicians is gradually taking the meaning of the word 'enemy' in authoritarian states, in which this phenomenon is used to expand their own power at the expense of human rights. On the other hand, the rhetoric of such individuals with respect to human rights and the need for their protection has become an ideology concealing numerous motives that have nothing to do with true protection of citizens and their rights and liberties. This can be supported by words of Michael Ignatieff, who, in his more than inspirational study on human rights, says that nowadays we intervene on behalf of human rights more than ever, but our interventions sometimes make things worse. He claims that instead of upholding human rights, our interventions may use the legitimacy of human rights as a universal basis for foreign policy (Ignatieff, 2006).

The threat that can be recognized with respect to counterterrorist legislation, jurisdiction and methods of security service and intelligence agencies, in the field of human rights derives from the ever more conspicuous domination of national priorities over individual security which, in the contemporary world, is accounted for by the need to efficiently oppose terrorism as a global social evil. The ratio between the efficiency of state and rights (particularly human rights) thus gains a new dimension in which the law itself justifies the need for efficiency by increasing power (expanding powers) of intelligence and security agencies and reducing legal restrictions of their activities. Certainly, it remains to be seen whether this phenomenon will induce changes in the role of these services and to what extent, as well as whether it may lead to departure from principles and values that the rule of law and democracy imply, above all consistent respect and protection of civil rights and freedoms.

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ANTITERRORISTIČKO ZAKONODAVSTVO, OBAVEŠTAJNO- BEZBEDNOSNE SLUŽBE I LJUDSKA PRAVA

Rezime

Primena pojedinih zakonskih rešenja usvojenih u najznačajnijim izvorima tzv. antiterorističkog zakonodavstva pokazala se u praksi kao izuzetno kontraverzna, naročito na polju njihove primene u radu obaveštajno bezbednosnih službi, gde su mnoga pomenuta rešenja u značajnoj meri dovela u pitanje sopstvenu opravdanost sa stanovišta zaštite osnovnih prava i sloboda građana. Rešenja tzv. antiterorističkog zakonodavstva su u značajnoj meri promenila i značajno proširila delokrug rada i nadležnosti i metode obaveštajno bezbednosnih službi i to na način kojim se, s jedne strane, afirmiše efikasnija borba protiv terorizma, ali, s druge strane, dovodi u pitanje opravdanost ovih rešenja naročito sa aspekta postojećih međunarodnih standarda za zaštitu osnovnih prava i sloboda građana. Veoma žustra polemika koja se tim povodom povelu ne jenjava ni dalje, a naročito intenzivna je ona polemika koja se odnosi na prirodu i širinu zakonodavnih ovlašćenja obaveštajno bezbednosnih. Rasprave po tim pitanjima vode se kako unutar naučne i stručne, tako i u okvirima šire javnosti.

Summary

Implementation of certain legal provisions contained in the so-called counterterrorist legislation has, in practice, turned out to be highly controversial, especially with respect to activities of security intelligence agencies, which in turn has raised the question of their justification with respect to civil rights and freedoms. Solutions contained in the counterterrorist legislation have significantly changed and to a great extent expanded the scope of operations, jurisdiction and methods of security intelligence agencies in such a way as to effect more efficient combating of terrorism on the one hand, but also so as to question the justification of these solutions, especially from the aspect of the existing international standards for the protection of fundamental civil rights and freedoms. The heated debate does not appear to calm down and it is particularly intensive with respect to the nature and scope of legal powers vested in the security intelligence services, their justification and possible threat to civil rights and liberties.

IRIS – A BIOMETRIC METHOD OF IDENTIFICATION OF PERSONS

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Abstract: Biometric identification of persons is based on physical (face, fingerprint, iris, retina, hand geometry) and behavioural (gait, keystroke dynamics, signature) characteristics which are unique for each and every person. Biometric identification methods allow for higher reliability and efficiency as well as a high degree of security of their application both for commercial and forensic purposes. As a part of the optical system of the eye, the iris allows for the identification of persons on the basis of a meshwork of radial lines which is unique, constant over time for each and every person and independent of genetic code. Due to universality, uniqueness, permanence, and reliability of biological characteristics of the iris, biometric identification of persons has the potential to become a leading biometric method of the future. The paper shall present basic characteristics of the iris, the history of this biometric method, as well as the process of identification. Also, the advantages and disadvantages of the method will be described, as well as its application and presence in criminalistics.

Key words: biometrics, identification, iris, iris scan

1. Introduction

Biometrics (Greek *bios* – life, *metron* – measure) is a science which deals with the development of methods of automatic recognition/identification of persons, based on measurable traits of the human body or behaviour (Biometrics History, 2009). Figure 1 shows the frequency of usage of biometric identification methods.

Biometric recognition of persons is based on physical (face, fingerprint, iris, retina, hand geometry) and behavioural (gait, keystroke dynamics, signa-

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ture) characteristics which are unique for each and every individual. Thus, biometric identification methods allow for higher reliability and efficiency as well as a high degree of security of their application both for commercial and forensic purposes.

As a part of the optical system of the eye, the iris allows for the identification of persons on the basis of a meshwork of radial lines which is unique, constant over time for each and every person and independent of genetic code. The paper shall present basic characteristics of the iris, the history of this biometric method, as well as the process of identification. Also, the advantages and disadvantages of the method will be described, as well as its application and presence in criminalistics.

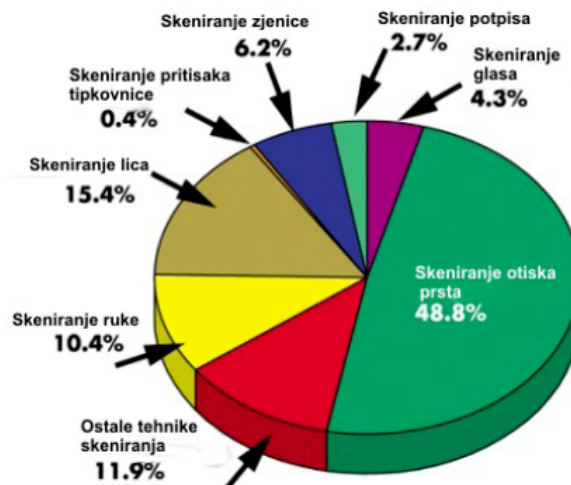


Figure 1 – Frequency of usage of biometric identification methods

The concept of using iris patterns as a method to recognise an individual originated from the ophthalmologist Frank Burch in 1936. In 1985 ophthalmologists Aran Safir and Leonard Flom patented the concept, while in the mid-1990s Dr John Daugman, a Harvard Professor, developed the algorithm for automatic identification based on iris recognition.

In 1993 *The Defense Nuclear Agency* started working on the system for iris-based identification of persons, while 1995 marked the first commercial use of this method. Since 2005, other companies have also launched their own algorithms for iris recognition (Biometrics History, 2009).

2. Iris

The human eye contains an extremely large number of individual characteristics which make it rather suitable for identification of persons. The iris and retina (Fig. 2) have turned out to be the most appropriate for such process.

The iris is an internal human organ that can be seen from the outside. It is positioned between the cornea and lens. It is between 0.3 and 0.4 mm thick, while the diameter is about 11 mm. It consists of the pupil-controlling muscle, chromatophores, melanocytes and pigments.

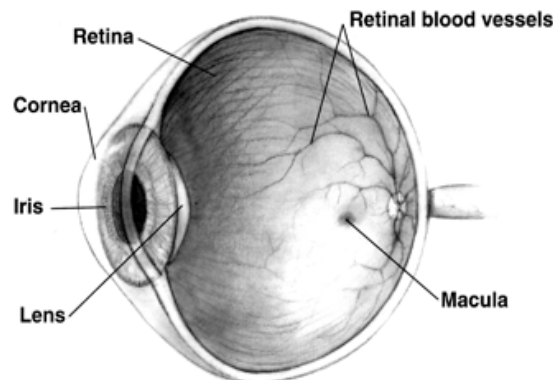


Figure 2 - Human eye anatomy

The iris is a coloured part of the eye surrounding the pupil and giving the human eye a specific colour which depends on the quantity and distribution of pigment on the front area of the iris. The iris plays the role of the eyeball diaphragm because it regulates the quantity of light entering the eye by means of a special muscle mechanism. It starts developing about three months after conception, while the characteristic lines and patterns are developed by the eighth month of gestation. Each and every person has a specific and unique appearance of the iris, similar to the fingerprint, which is essentially important for identification.

An integral part of the iris is a meshwork of radial lines which are unique, stable over time and independent of genetic parameters. The iris has about 250 structural characteristics unique to every person, even with identical twins (unlike DNA). It is important to note that even with the same person the left and right eyes differ (Biometrics History, 2009; Biometrija, 2009; Iris Recognition, 2009; Retina and Iris Identification, 2009; Radmilović, 2008).

2.1. Identification

Iris-based recognition of persons is one of the most reliable biometric methods because the appearance of the iris does not change throughout lifetime, except in case of disease, surgical interventions or injuries involving damage of the eye itself.

Iris biometrics exploits unique characteristics and features of the human iris in order to verify a person's identity. It is based on the analysis of elements specific to the coloured ring surrounding the pupil of the eye.

The iris possesses about 250 characteristics that can be used for comparison. Iris scan devices use a common camera and do not require direct contact with the person to be identified. The person positions him-/herself in front of the iris scan device, so that he/she can see the reflection of the eyes on the device.

After the acquisition of the eye image, the iris is located, the centre of the pupil found, iris boundaries are detected and linked to the centre, after which filtration is performed. The image is recognised in a radial manner in order to determine its outlines. After this, the characteristic spots on iris surface are found, and then its structure is transformed into a series of vectors in a complex plain and translated into a polar coordinate system. Thus the size of the iris image, its position and pattern orientation do not affect code production (Fig. 3). The obtained iris code is matched to the codes stored in the database, which represents the process of identification (Iris, 2009; Iris Recognition, 2009; Retina and Iris Identification, 2009; Iris Recognition Biometric Authentication Information, 2009).

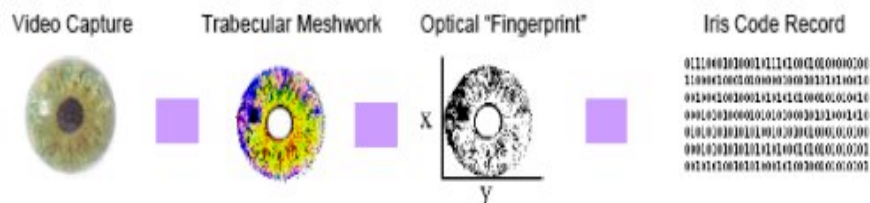


Figure 3 - Iris recognition process

The iris is an almost ideal part of the human body for biometric identification. In that respect, the most important advantages of using iris biometrics can be summed up as follows:

- The iris is protected against external influences;

- Iris characteristics remain unchanged throughout lifetime and are independent of genetic code;
- The iris pattern is visible from a distance, which is an advantage compared to retina-scan technology;
- After years of hard manual work, fingerprints can be difficult to recognise, unlike the iris which does not change its fine texture even after surgical interventions;
- Unlike the face, the iris is almost flat, therefore easier to recognise;
- The iris is different even with identical twins, which is not the case with their DNA codes;
- Iris biometrics is a “clean” technology; the person to be identified stands at e.g. 10 cm distance from the reader, so he/she does not have to touch its surface, which is the case with retina or fingerprint scans;
- Iris biometrics allows for recognition to be performed at a distance of a few meters;
- Current population of the Earth is approximately 10^{10} , population that has ever lived on the Earth is approximately 10^{11} , while the probability of two individuals having the same iris pattern is 10^{78} ;
- The left and right eyes of the same person are different;
- The time needed for the identification is less than 2 seconds;
- Recognition speed is not affected by the size of the database (Iris Recognition Technology, 2009; Iris, 2009; Iris Recognition, 2009; Retina and Iris Identification, 2009; Iris Recognition Biometric Authentication Information, 2009).

Although there are numerous advantages, this method, as any other biometric identification method, has some disadvantages as well. They could be summed up as follows:

- The technology is more expensive compared to fingerprint identification;
- Iris scan is difficult to perform at a distance larger than a few metres;
- The person being scanned has to be absolutely still;
- Occasional eyelid movements disturb scanning process;
- The iris is movable during scanning;
- Poor image quality;
- Small number of enrolled persons (relatively small database) compared to the fingerprint database;
- Civil rights advocates believe that such system of identification violates privacy (Iris Recognition Technology, 2009; Iris, 2009; Iris Recognition, 2009; Retina and Iris Identification, 2009; Iris Recognition Biometric Authentication Information, 2009).

2.1.1. Method application

Iris scan is a technology mostly applied to control access to certain premises, and to keep statistics of visitors. The system found its application as early as 1994 for the identification of prisoners and as a security check of employees in several prisons in the USA.

After September 11, 2001, many countries have raised levels of security to protect vital facilities, so the method has been applied to control the access to certain airport premises, hospitals, housing units, databases, to ensure aviation safety and to register to and access computer networks.

One of the countries widely using the iris scan technology is the United Arab Emirates, where the method is applied in all airports, sea ports and border crossing points where all the people entering the country are subject to this manner of identification.

The UNHCR introduced this system of identification at the border of Afghanistan and Pakistan, which was also done by the American Army in Iraq.

In addition to its use in securing and control of vital facilities, the method is used in some schools in Great Britain to pay for meals in school canteens (Iris Recognition, 2009; Iris/Retina Biometrics, 2009).

2.1.1.1. Possible abuses

Regarding possible abuses of iris-based identification, the following should be pointed out:

- The system cannot be spoofed by wearing contact lenses since there are algorithms for detection of false access;
- A glass eyeball or real eyeball that has been removed from the human body cannot be used to spoof, because the pupil in such eyeball is still (constant movement, contractions and dilations).

Naturally, this method, just like all other biometric identification methods, is not hundred percent reliable. It can be mentioned, by way of illustration, that a group of German researchers managed to spoof one of the commercially-used recognition devices. Namely, they printed a high quality eye image on a high resolution printer (2400x1200 dpi), making a hole in the middle. That is how the iris-capturing device saw a “live” pupil. In real life, it would not be easily accomplished because expensive equipment is needed; in addition, it is not possible to obtain a high quality image of someone’s eye without that person’s knowledge (Iris Recognition, 2009).

3. Conclusion

Application of biometrics and biometric identification methods in all areas of human life, including criminal investigations, is already significant, regarding both the scope and substantial enhancement of the quality of life and operations.

A large volume of biometric data in e-form can be searched through, copied, modified and compared fast. In fact, this is the substantial difference when compared to the data not stored in e-form which did not allow specific information to be used in automated processing. Although it is quite clear that there are benefits as regards processing speed and increased productivity, a critical analysis of application of biometric data shows that it can lead to massive abuses.

Some biometric methods can be said to be just emerging, but the possibilities for their development and establishment of new ones are enormous. The interest of the society is to continue research and development of biometric identification methods in the area of public and private security.

The application of biometric identification methods will more and more contribute to the efficiency of authorities and bodies involved in crime suppression; therefore, in addition to the well-known methods such as DNA analysis, dactyloscopy (AFIS), handwriting and signature comparison, other biometric identification methods will also find their role and application regarding identification of perpetrators of criminal offences.

Due to universality, uniqueness, permanence, and reliability of biological characteristics of the iris, biometric identification of persons by means of iris recognition has the potential to become a leading biometric method of the future.

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IRIS -BIOMETRIJSKI METOD IDENTIFIKACIJE OSOBA

Rezime

Biometrijska identifikacija osoba zasniva se na fizičkim i bihejviorističkim karakteristikama, jedinstvenim za svaku osobu. Primenom biometrijskih metoda postiže se pouzdanost, efikasnost i visok stepen bezbednosti pri identifikaciji osoba. Imajući sve to u vidu može se pretpostaviti da će biometrijska metoda identifikacije osoba prepoznavanjem irisa postati vodeća biometrijska metoda u bliskoj budućnosti. Iris kao deo optičkog sistema oka omogućava identifikaciju osoba na osnovu mreže radijalnih linija koja je jedinstvena, vremenski nepromenljiva za svaku osobu (osim u slučaju bolesti, hirurških intervencija ili povreda kada je oštećeno i samo oko) i nezavisna od genetskog porekla. Iris poseduje oko 250 strukturnih karakteristika koje su jedinstvene kod svake osobe, čak i kod jednojajčanih blizanaca. Biometrija irisa koristi jedinstvene karakteristike i obeležja ljudskog irisa u cilju verifikacije identiteta osobe i zasniva se na analizi pojedinosti prstena u boji koji okružuje zenicu oka. Pored mnogobrojnih prednosti, ova metoda, kao i svaka druga biometrijska metoda identifikacije, ima i nedostataka. Ova metoda ima komercijalnu i forenzičku primenu.

Summary

Biometric identification of persons is based on physical and behavioural characteristics which are unique for each and every person. The application of biometric methods ensures reliability, efficiency and a high degree of security of identification of persons. Having all this in mind, it may be assumed that biometric identification of persons by means of iris recognition will become a leading biometric method in the near future. As a part of the optical system of the eye, the iris allows for the identification of persons on the basis of a meshwork of radial lines which is unique, constant over time for each and every person (except in case of disease, surgical interventions or injuries involving damage of the eye itself) and independent of the genetic code. The iris has about 250 structural characteristics unique to every person, even with identical twins. Iris biometrics exploits unique characteristics and features of the human iris in order to verify a person's identity. It is based on the analysis of elements specific to the coloured ring surrounding the pupil of the eye. Although there are numerous advantages, this method, as any other biometric identification method, has disadvantages as well. Iris recognition has commercial and forensic applications.

Guidelines for Authors

General notes	<i>NBP - Journal of Criminalistics and Law / НБП - Журнал за криминалистику и право</i> publishes original scientific papers in English language.
Title of a paper	Title: font size 14 pt, bold
Authors	The surname and the first letter of the name of the author should be stated (font size 12 pt).
The name and address of the institution	The name and full address of the institution where the author works and a footnote which should state a corresponding author complete with his/her e-mail address.
Abstract	The abstract should contain from 100 to 250 words (font size 10 pt).
Key words	Not more than 10 key words
Text	<p>The papers should be sent as follows:</p> <ul style="list-style-type: none"> - Two printed copies in English and one copy in Serbian, as well as - in electronic form, just in English language. <p>The papers should not exceed 16 standard computer-printed pages (A4 format).</p> <p>The papers are prepared in MS Word format, Times New Roman font, single spacing, with the following margins:</p> <p>Top – 2,5 cm, Bottom 2,5 cm Left – 3 cm, Right – 2,5 cm</p>
Text structure	<p>Titles of chapters, sections and subsections should be written in font size 13 pt, bold.</p> <p>1 Introduction 2 Chapter 1 2.1 Section 2 2.1.1 Subsection 3 3. Conclusion 4. References</p>
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