GENESIS AND PROSPECTS OF FORENSIC BIOMECHANICS

Prof. PhDr. **Jiří Straus**,
University of Finance and Administration, Prague,
Estonská 500, 101 00 Praha 10-Vršovice, Check Republic,
<straus@email.cz>

Annotation

In recent five or ten years in a criminalistic scientific community there has been a clearly evident scientific discussion on a criminalistics science theory, criminalistics system, matter of criminalistics and a relation of criminalistics science to other scientific fields, primarily to forensic sciences with whom criminalistics is closely connected. Due to proceeding scientific knowledge and research of these scientific fields in past times somewhat related to criminalistics this relation has been deepen step by step. Criminalistics also uses parts of knowledge from other sciences in their unaltered form. It concerns mostly forensic sciences, such as forensic medicine, forensic psychiatry, forensic psychology, forensic engineering and recently also forensic biomechanics.

Keywords: criminalistics, forensic biomechanics, forensic sciences.

Introduction

Criminalistics is a fundamental police discipline and if it makes some sense nowadays then its theoretical, systemic, mathematical and police detail must be stressed. After establishing a police science criminalistics hardly loses its independent position within the science system, quite the contrary it will be developed in the police science framework and will have an impact on the police practice.

Criminalistics is explicitly comprehended as an independent scientific field having its institutional base in a series of criminalistics research and expertise workplaces all over the world. Even though criminalistics includes and uses the elements of technical and natural sciences due to its aims it belongs to the social sciences. There is the closest connection between the criminalistics and legal sciences. (Legal sciences are sciences dealing with the law.) Although some criminalists regard criminalistics as a legal science, Czech and Slovak criminalists do not consider criminalistics to be part or branch of a legal science. Anyway criminalistics does not investigate connections of law or legal relations.

Criminalistics is closely connected with criminology. Both of these two scientific disciplines study the identical objects but connections of objective world

investigated by criminology diametrically differ. Criminalistics is also closely connected with a substantive law, law of procedure and as well with part of an administrative law – a security law. However, these legal branches only create a legal framework for criminalistics science and also for criminalistics practice.

Even criminalistics has a close relation to a number of natural and technical sciences so the criminalistics science borrowed knowledge from mathematics, physics, chemistry, biology, anthropology, mechanics, and from other scientific disciplines. Criminalistics borrows knowledge from these sciences with the aim to adapt them in a qualitative way to criminalistics methods unravelling events relevant to criminalistics.

Criminalistics science also borrows a portion of other sciences knowledge in an unchanged form and uses them. It deals above all with forensic disciplines such as forensic medicine, forensic psychiatry, forensic psychology, forensic engineering and lately also forensic biomechanics. These disciplines have been constituted on the basis of the expert research to meet the demands of the investigation and they are relatively independent on original scientific foundations. Forensic disciplines began successively developing research activities of their own on knowledge basis not only through their parent fields but also through the generalization of acquired experience from expert activities. So in this way they established a very close relation with criminalistics. Some opinions emerged making possible to comprehend forensic sciences as part of the criminalistics science in a broader sense but this attitude has not been accepted by our criminalistics community yet. The forensic disciplines are mostly objected to draw their fundamental part of knowledge from their parent disciplines. However, it is indisputable that contacts between criminalistics and forensic sciences are exceptionally close. They enrich each other and to determine the line between them is impossible in essence.

In present times, criminalistics is in regards to contents and forms of research an independent and widely interdisciplinary scientific field. Criminalistics uses specific methods and knowledge from other fields and applies these methods to its own subject of examination (patterns of formation, accumulating and using of traces and forensic evidence), and creates combination of information in the interest of successful discovering, investigating and preventing criminal activity. Scientific fields of which chosen information are used in a creative manner, involve mainly physical mathematical and technical fields, biology, medicine, psychology, psychiatry, management, pedagogy and others. Also important is using of knowledge from special disciplines, such as bionics, biochemistry, cybernetics, forensic engineering or a new, very progressive

branch of forensic biomechanics.

Criminalistics also uses parts of knowledge from other sciences in their unaltered form. It concerns mostly **forensic sciences**, such as forensic medicine, forensic psychiatry, forensic psychology, forensic engineering and recently also forensic biomechanics[1]. Forensic sciences are generally restricted to sciences which are applied to investigation and substantiation regarding criminal and civil trials in front of state administrative bodies. This concerns procedures leading to revealing identity, authenticity of documents etc.

These disciplines are constituted based on an expert examination. The investigation requires them to be relatively independent from their original scientific foundations. Forensic disciplines began to develop their own research activity based not only on the information drawn from their own native scientific fields, but also on the generalization of the acquired observations from the examinations. This means that forensic disciplines are very closely connected to criminalistics. Some opinions suggest that it could be possible to perceive forensic disciplines as part of the crime science, but this approach is not yet accepted by our criminalistics community. It is often objected that forensic disciplines draw most of their expertise from their native scientific disciplines. However, we cannot deny the fact that the connection between criminalistics and the forensic disciplines is extremely tight, reciprocally enriching and it is basically impossible to draw the line between the two.

The term forensic science in western literature is quoted variously, for example the **American Academy of Forensic Sciences** (AAFS) defines it: "*The forensic science is an application of the scientific principles and technological procedures for the purpose of impartialness in studying and solving criminal and civil inquiries*". In this definition, the AAFS considers criminalistics as one of the forensic sciences[2].

In the last twenty years, many terminological and theoretical opinions arise, questioning the use of the term "forensic". Experts ask what is **the relationship between criminalistics and forensic sciences from the point of view of present criminalistics theory**. In the last two decades, forensic sciences are often discussed in our criminalistics literature. Before the year 1989, forensic sciences were only discussed regarding the integration of collateral scientific fields into the criminal examination. When the borders opened and the import of

1 Straus, J. (2021). *Forenzní biomechanika. Teoretické, experimentální a empirickémetody*. 1. vyd.; Porada, V., Straus, J. (2018). *Forensic biomechanics. Criminalistic and Forensic Application.* 1. vyd.

2 Straus, J., Porada, V. (2017). *Teorie forenzní biomechaniky*. 1. vyd.

western literature into our culture began, the terminology of western countries along with terms such as "Forensic science" or "Forensische Wissenchaften" started being used.

It can be stated, that the term "forensic" in our criminalistics literature was developed from the earlier used term "criminalistic-technical". However, the criminalistic-tactical methods are not viewed as forensic. The terms such as forensic ballistics, forensic anthropology, forensic biology, but also forensic psychology, psychiatry etc. are commonly used. On the other side, we do not use the terms forensic interrogation, forensic experiment, forensic recognition and so on. From this we can conclude that forensic sciences can be replaced in our conditions with the term "criminalistic-technical".

From our point of view, criminalistics is a wider scientific discipline that also incorporates forensic sciences. Criminalistics involves not only criminalistic-technical methods, but also criminalistic-tactical methods, individual methodologies of investigating crimes, and theoretical questions of criminalistics.

We can notice two major views of criminalistics. In the countries which use Anglo-Saxon law, especially in the USA and the Great Britain, criminalistics is labeled with the term *forensic science*. Understanding of criminalistics has its ground mainly in biological and technical examination and the technical and criminalistic examination of traces is greatly accentuated.

In the countries of continental law, the term "criminalistics" is more frequently used. This term involves not only the field of technical examination, but also criminalistic tactics and methodology. Some countries emphasize the technical side (France), while other prefer the scientific basis (USA). Although, the term "criminalistics" is nowadays used more and more often and the approach and terminology are beginning to uniformalize.

Criminalistic science is always going to develop in such way and tempo that is set by the theoretical base. I advocate the opinion that this development is not only set by the theoretical base, but also by the criminalists-theoreticians themselves. That's why it is necessary to not only develop the applied, imminent research, but also spend intensive time and theoretical research on major criminalistic problems and categories.

What are the current forensic sciences like?

The group of scientific fields making the solving and unravelling of crimes possible is known for their different terms. Criminalistics is the first one and forensic science appears to be the second one. The term criminalistics is simply

derived from an English word crime = zločin. The origin of term forensic is in Latin word – forum which means market. So that's why the law in a Roman society was executed publicly at markets. The word forensic is broadly accepted as the name of anything connected with the law execution.

Due to the progress of scientific knowledge forensic sciences have been expanded and at present it is possible (in our opinion) to specify them like that:

1. Forensic medicine;
2. Forensic psychiatry, psychology;
3. Forensic sexology;
4. Forensic engineering;
5. Forensic biomechanics;
6. Forensic biology, anthropology…

From time to time there are some efforts in a professional literature to include only marginally into forensic sciences also forensic entomology and forensic anthropology (the term forensic anthropology is very frequent in Slovak professional literature). Even the term – criminalistic molecularly genetic expert opinion has in scientific circles its equivalent – forensic genetics. These applications have not been profiled into independent scientific disciplines and so they cannot be comprehended for the time being as independent forensic scientific disciplines.

Forensic sciences significantly influence criminalistics science development and contribute to objectification of decoding criminalistic relevant information coming from criminalistic traces. Forensic sciences professional range is quite broad.

Biomechanics and its current structure

Biomechanics is defined as a field which contributes to the solution of those biological and medical problems, including the sub-problems of a mechanical character, the so-called "biomechanical problems". They use the knowledge, approaches, methods and theories of mechanics. Biomechanical problems are solved on biomechanical objects, which can be of a different nature. These may be elements of the flora or fauna in Biomechanics it may be a technical object, in different interactions with the human organism (implant fixator), or is itself the human organism as a whole or its unseparated (in vivo), respectively. separate part (in vitro).

Biomechanics is thus defined as a discipline that exploits everything from mechanics to solving problems in the field of bioobor, especially in medicine

and biology[3].

Biomechanics is defined as interdisciplinary science, focusing primarily on the mechanical structure and mechanical behavior of living systems and their interactions with the environment[4].

Biomechanics is at the beginning of its development, but has already achieved many successes. Its goals are limited so far, because it soon became clear that the description of isolated phenomena did not provide usable results. That is why we are gradually turning to modeling of complex systems today, at the cost of difficulties in mathematical description and experimental techniques. We have shown that the new quality of the system was created by the transfer of information and its processing. However, this is connected with the integrity of the whole system and its reaction to the environment. The current methodology of studies is still largely devoted to efforts to isolate parts of the whole and to describe their connection by simpler boundary conditions, as is the case in the classical mechanics of the continuum. The current goal is to obtain generally valid knowledge as simple as possible and in a sufficiently precise manner[5].

More mathematical models need to be used to describe more complex knowledge. The mathematical model describes reality only approximately, but without it is not yet possible to work with the mechanics.

The first step is to find the geometric parameters of the tissues, organs, organ structures and substructures of these objects we are studying, and the choice of their appropriate models (plate, beam, membrane, fiber, etc.).

The second step is to find out the material properties and again to choose their corresponding models, i. e. constitutive or material equations. For biomechanics, it is characteristic that this step is very difficult. It follows from the fact that the material properties of living tissues are complex and, moreover, we can study the tissues, we have to remove them from the body (mostly post mortem), and then we examine the properties that are already partially different from in vivo conditions. However, finding this fact is not a challenge to pessimism, we need only be aware that we are working with less precision than classical mechanics, and therefore we need to place greater emphasis on constant verification and comparison of the results we get from different approaches.

The third step is the mathematical processing of the given task: Based on

3 Janíček, P., Marek, J. (2013). *Expertní inženýrství v systémovém pojetí.*

4 Karas,V. (1978). *Biomechanika pohybo vého systému člověka*.

5 Straus, J. (2021). *Forenzní biomechanika. Teoretické, experimentální a empirickémetody*. 1. vyd.

the general laws of mechanics, information on the geometry of the external and internal structure, and finally on the basis of material equations we derive the initial equations corresponding to the given problem and solve them for the respective marginal or initial conditions.

The fourth step is to verify the results by observing and measuring on an object, preferably in in vivo conditions, and correcting the initial hypotheses and parameters.

The fifth step is to use in diagnostics, therapy, prevention, or application in technical constructions. This whole journey is difficult and so often uncompromising. History of science, however, teaches us that partial knowledge has often been used with excellent results, and much later, the issues have been thoroughly elucidated and understood[6].

The equations of mechanics developed for the action of bodies must naturally apply to living organisms, but they are not sufficient. The main subject of biomechanics is the study of processes in complex living systems and the axioms of classical mechanics are the basis from which the laws of thermodynamics of open systems, microbiology, etc. have to be based and are gradually being supplemented.

Biomechanics can be broken down by these criteria[7] :

Depending on the type of bio-object on which the biomechanical problem is addressed, there are:

- **Biomechanics of humans** – it is the largest and most elaborate field of biomechanics, dealing with a wide range of biomechanical problems. Its origins date back to the time of Aristotle (emphasizing the necessity of interconnecting physics with living objects), Demokritus (explained in a coherent way the properties of living and inanimate matter on the basis of atomism) and Hippocrates (a treatise on the renewal of bone tissue). Leonardo da Vinci first described the mechanics of human body movement and bird flight mechanics.
- **Biomechanics of animals** – deals with many similar problems like human biomechanics.
- **Plant biomechanics** – deals with, for example, stiffening and strength problems of stalks of plants, flow of nutrients through individual parts of

6 Porada, V., Straus, J. (2018). *Forensic biomechanics. Criminalistic and Forensic Application.* 1. vyd.

7 Straus, J. (2021). *Forenzní biomechanika. Teoretické, experimentální a empirickémetody*. 1. vyd.; Janíček, P., Marek, J. (2013). *Expertní inženýrství v systémovém pojetí*.

plants, transmission of electrical signals during photosynthesis.

By the mechanics sector, which is used to solve a biomechanical problem. There are:

- **Biotermomechanics** – deals with the problems of conducting, sharing and convection of heat in bioobjects.
- **Biohydromechanics** – deals with hydromechanical and hydrodynamic problems of biocapalins (in lice trees, in human blood, lymphs, urine).
- **Bioaerodynamics** – deals with the flow of gases (eg. air flow through the nose, around the vocal cords, the larynx and the lungs).
- **Solid Phase Biomechanics** – deals with the movement of bodies, their deformations and violations of cohesion.

Depending on the type of modeling it uses to solve the problems of human biomechanics:

- **Experimental biomechanics** – when the problem is solved, the experiment has the current preference – calculations only have a secondary role; they are mainly used in the processing of measurement results, also as part of measurement planning.
- **Computational biomechanics** – the current modeling problem is the preference for solving problems. Its use is conditional on the existence of theory in mathematical expression, its solvability and feasibility on the computing means, and there must also be input data into the algorithm of the respective direct or indirect task. At present, numerical methods are used in the solution of biomechanical problems for clinical practice, especially in the form of the finite element method.

Depending on the target behavior of biomechanics:

- **Cognitive biomechanics** – it has the character of a purposeful, systematic and objectified knowledge of bio-organisms from a certain point of view using mechanics. Above all, it is about knowing the properties and behavior of the elements and their linkages in the bioequence, the properties and behavior of the bioobject as a whole and its links with the environment. These include, for example, research into the mechanical properties of tissues, their behavior under load, limit state of tissues, properties research and flow of biotekutins, kinematics and dynamics of the musculoskeletal system,
- **Clinical Biomechanics** – deals with the solution of specific clinical problems in bioobjects whose structure (elements, links) has become a pathological condition, and there is a high probability that by linking medical and engineering approaches, possibly using technical implant objects, the

pathological condition can be completely or partially removed. Clinical biomechanics can be temporarily or permanently implanted into implantable.

- **Constructive biomechanics** – the aim is to use knowledge and method of mechanics in the design and implementation of technical objects with a certain target behavior, which serve to solve clinical problems. Technical objects may be of a diverse nature: from surgical and orthopedic devices through temporary or permanent implants to devices to maintain or restore physiological functions.
- **Criminalist biomechanics** – is a collection of criminological approaches and methods utilizing the knowledge of mechanics to obtain and disseminate information on the causes of the offense, the objects involved in its implementation and the characteristics of the perpetrator, all based on known information about the consequences and circumstances of the offense. It is a crime of human traces in a bi-directional "human-environment" interaction that contains information decodable using the knowledge of mechanics.
- **Sports Mechanics** – is a discipline using mechanics to solve problems related to human activities,

Interactive Biomechanics – deals with the problems related to the environment-human interactions, as well as the prevention of the adverse effects of these interactions and the rehabilitation problems in the elimination of their consequences. On the periphery, there is also the issue of the inversely oriented interaction, ie "man – environment", which is the object of ecological engineering.

According to the elements of the human body structure, which are concerned with clinical and cognitive biomechanics. At the highest level of the hierarchy of the human body, it is the biomechanics of the individual functional systems of the human body. There are biomechanics: musculoskeletal, cardiovascular (circulatory), respiratory, digestive, urinary, reproductive, dental biomechanics and biomechanics of sensory organs. Biomechanics of skeletal, cardio-vascular, dental and urinary and biomechanics of auditory organs can be broken down into implantable and implantable.

The biomechanics of the musculoskeletal system can be divided into the following elements:

- **Biomechanics of hip, knee, elbow, ankle joint**. Non-implantation hip joint biomechanics, for example, addresses these problems by examining deformation-stress states in bones and hip joints and in articular cartilage

in their physiological and pathological states. Biomechanical assessment of various types of osteotomies in the reconstruction of pathologically developed hip geometry. Influence of the sheer size (covering of the hip joint hip) on the distribution of the contact pressure between the hip and the hip.

- **Implantation biomechanics of the hip joint**. Possibilities of partial and total endoprostheses in terms of deformation-stress states in the elements of the endoprosthesis and in the adjacent bones. The problem of interactions of the endoprostheses with the adjacent bones, ascertaining the causes of the occurrence of mechanical limit states in the elements of the endoprostheses and the adjacent bones. Influence of hip endoprosthesis geometry, acetabular material structure and mechanical interaction of cemented hip endoprostheses with thigh bone.
- **Biomechanics of the spine**. Determination of deformation-stress states in spine elements in various methods of spinal strain, computational and experimental verification of stiffness and strength properties of lumbar fixators.
- **Biomechanics of long and short bones**. Structural and shape optimization of intramedullary nails used in fractures of femurs and sliding screws used in fractures of the neck of this bone. Controlled osteotomy of long bones
- **Biomechanics of muscles** – tearing and tearing of muscles, tendons and tendons, micro-biomechanics, sarcomers, etc.

Biomechanics of the cardiovascular system can be decomposed into the following elements:

- Heart Biomechanics:
- Biomechanics of blood vessels
- Biomechanics lived

Biomechanics of the dental system – these problems are solved, for example:

- Computational modeling of deformation-stress states in bonded dental bridges made of composite materials, including determination of deformation limit states,
- computational modeling of dental teeth insertion, computational modeling of the dental implant interaction with the lower jaw,
- computational modeling of deformation-stress states in the lower jaw from the force effect between the teeth at various points of the lower jaw.

Biomechanics of hearing system – solved problems are:

- modal and harmonic analysis of the external auditory canal,
- the influence of the frequency and the shape of the oscillation on the response of the drum,
- cochlea computational modeling and basilar membrane responses to mechanical excitation from middle-sized bones,
- deformation-stress analysis of middle ear bones when transferring sound to the inner ear.

Using biomechanics in criminalistics is first of all dependent on the crime trace itself. Opportunities for biomechanics use in criminalistics are also depend on the fact if the trace contains any biomechanical contents that means some coded information on perpetrator musculoskeletal apparatus and his locomotive behavior reflected in the trace.

Forensic Biomechanics is a scientific field using biomechanics and biomechanics methods on investigating criminalistic traces having biomechanical contents and decoding information of a criminalistic relevant event that has resulted from human being move activities and that has been connected with the investigated event. Forensic biomechanics studies and clarifies the sphere of criminalistic traces having biomechanical contents so the mentioned applications inform of a criminal's soma or his/her locomotive behavior. Forensic biomechanics seems to be according to its research subject some kind of intersection between biomechanics and criminalistics. In a creative way it applies biomechanics methods of research, procedures and problem solving on criminalistics problems. Forensic biomechanics studies and investigates a locomotion system and persons locomotive behavior being connected with a crime and leaving criminalistic traces with coded biomechanical contents in themselves. The term "forensic" biomechanics has been used for the application of biomechanics on investigating and studying criminalistic traces.

Current Trends of Forensic Biomechanics Applications and Prospects of Forensic Biomechanics Development

Conclusion

Forensic biomechanics uses biomechanics and its methods of knowledge in two important directions[8]:

1. Criminalistic traces having biomechanical contents

[8] Straus, J. (2021). *Forenzní biomechanika. Teoretické, experimentální a empirickémetody*. 1. vyd.

2. Relevant criminalistic changes occurring as a result of a mechanical interaction of "man-his/her surroundings system".

In case of forensic biomechanics practical applications, the two following directions of research can be indicated on the basis of experience and literature comparison. Both of them differ from each other fundamentally as to the subject matter of scientific and epistemological approach.

Biomechanical contents of trasological traces this research direction has been studied and developed the most intensively for the time being. The reason is that trasological traces of footwear and locomotion traces occur at the crime scenes in 95,5% and also decoded information can be practically usable for the criminalistics practice. Study of biomechanical contents of bipedal locomotion trasological traces has been logically aimed at geometric characteristics firstly, then at the kinematic ones and last but not least at dynamic characteristics.The latest researches show that part of information on biomechanical contents dynamic characteristics can be obtained through study of one barefoot print and so it is not necessary to know parameters of a locomotion path. Applications are elaborated and worked out to determine the person´s body height with the help of locomotion traces in various kind of a base.

Biomechanical contents of handwriting traces. For the time being these applications are at their beginning because of uneasy quantification of single characteristics. Most handwriting characteristics have a qualitative character and their qualification mostly causes considerable difficulties. Despite this fact there have been some research trends having a good application for criminalistics practice.

A study of biomechanical contents of the hands internal sides, palms possibly. This kind of trasological traces have not been studied so far and not even used in the practice because of the lack of information. Traces of hands internal sides and palms have been described in criminalistics literature rather sporadically most of all following the aim to identify the person using the traces left the perpetrator at the crime scene. The criminalistics literature gives options of a person identification using marks of the criminal gripping a murderous item, resting the hands on the pad and last but not least it also indicates ways how to determine anthropometric proportions in case a decaying corpse or skeletal remains have been found.

The mechanical extreme dynamic loading of an organism. Mostly they are such situations when the assailant attacks a victim by giving him/her a punch or hitting him/her with a stick or another solid item. Most often the attack is directed at the head of the victim. In case of these biomechanical analyses the

problem is to assess the fact if the attacked person died immediately or if he/she lived for some particular time so there was some chance to rescue him/her. In essence it is very important to set and quantify the limit that will be crucial for survival under the conditions of a mechanical extreme loading of the victim's head.

Biomechanical assessment of falling a victim from high, out of the window most often. From time to time there is a case when an aggressor attacks a victim with the intention of killing he throws him/her out of the window while in the course of the investigation he defends himself/herself claiming the victim has dropped out by himself/herself or the incident has been caused by some misadventure. The biomechanical analysis can judge the issue if the person has dropped out by himself/herself without the fault of somebody else or if at the very moment of falling he/she was given a strength impulse therefore he/she has been thrown by someone (possibly he/she could take off). It is the problem of geometry and kinematics, further the problem of a body gravity center in the course of falling as an open kinematics series.

The use of biomechanics in motor vehicles construction and their equipment. There is included the investigating of the relations between a mechanical characteristic of the car and the situation when the driver is getting tired, further the seat construction, brakes, securing against the force impulses caused by frontal impacts etc. Other factors are motoric and biomechanical ones such as visibility, reaction capability and the duration of needed movements.

Biomechanical application in the course of contact combating in self-defense. It is very important for police practice. For self-defense elements it is necessary to know kinematic characteristics of a person reaction from the point of view of an attack and defense. Biomechanical analysis helps to eliminate some imperfections.

KRIMINALISTIKOS BIOMECHANIKOS GENEZĖ IR PERSPEKTYVOS

Jiří Straus

Santrauka

Teismo biomechanika yra jauna teismo ekspertizės šaka, kurios vystymasis buvo labai spartus, o ateitis, atrodo, yra disciplina, kuri be kita ko, padės geriau

ir efektyviau kovoti su nusikalstamumu. Teismo biomechanika išsprendžia problemas, į kurias negali atsakyti joias kita teismo ekspertizės sritis. Biomechanika apibrėžiama kaip disciplina, padedanti spręsti biologines ir medicinines problemas, kurios apima subproblemas ir mechaninį pobūdį, vadinamą „biomechaninėmis problemomis“. Jų sprendimuose naudojamos mechanikos įžvalgos, požiūriai, metodai ir teorijos. Biomechaninės problemos sprendžiamos ant biomechaninių objektų, kurie gali turėti skirtingą charakterį. Tai gali būti floros ar faunos elementai. Biomechanikoje tai gali būti techninis objektas, kitokioje sąveikoje su žmogaus organizmu (implantų fiksatorius), arba pats žmogaus organizmas kaip visuma, arba jo neatskiriama (in vivo), tačiau sąlyginai savarankiška dalis. Biomechanika apibrėžiama kaip tarpdisciplininis mokslas, daugiausia orientuotas į gyvų sistemų mechaninės struktūros ir mechaninės elgsenos bei jų sąveikos su aplinka tyrimą. Teismo biomechanika – tai mokslas, taikantis biomechaniką ir biomechaninius metodus tiriant biomechaninio turinio tyrimo pėdsakus ir iššifruojant informaciją iš kriminalistikai reikšmingų įvykių, atsiradusių dėl žmogaus veiklos ir judėjimo, susijusio su tiriamuoju įvykių.

Raktiniai žodžiai: kriminalistika, teismo biomechanika, teismo ekspertizė.