

CONTENTS

1 INTRODUCTION	3
2 BASIC MECHANICAL PROPERTIES OF TISSUES OF THE LOCOMOTION SYSTEM	5
2.1 Introduction	5
2.2 Bone tissue	6
2.3 Cartilage tissue	26
2.4 Muscle tissue	31
2.5 Tendons and ligaments	34
References to Chapter 2	40
3 SKELETON — THE BASIC OF THE SEGMENTARY STRUCTURE OF THE BODY	53
3.1 Introduction	53
3.2 Joint connections	58
3.3 Effecting active motion in joints	66
3.4 Some remarks on the problem of the rheology of articular connections	70
3.5 The problem of identifying the forces affecting skeletal elements in motion	77
3.6 The influence of the geometric parameters of the skeleton and of body motion on the loading of joints	79
3.6.1 Introductory remark	79
3.6.2 The contact problem	79
3.6.3 A note on the classical theory of contact between two inanimate bodies	80
3.6.4 Possibilities of theoretical prediction of the effect of the geometric properties of skeletal segments and of body motion on the loading of joints	83
3.6.5 Some examples of the effect of the geometric properties of the skeleton and of motion on the loading of joints	84
References to Chapter 3	111
4 THE LOCOMOTIVE APPARATUS OF MAN	123
4.1 Introduction	123

4.2	Composition of the locomotive apparatus	123
4.3	Elements and bonds of the locomotive apparatus	125
4.4	System of skeletal muscles	127
4.4.1	Muscle structure	127
4.4.2	Fundamental rheological properties of living non-active muscle	139
4.4.3	Muscular contraction	144
4.4.4	Thermomechanical aspects of muscle contraction	165
4.4.5	Mechanical properties of active skeletal muscle	179
4.4.6	Some problems of the study of the behaviour of human muscles under natural conditions	190
	References to Chapter 4	194
5	GENESIS AND PROSPECTS OF FORENSIC BIOMECHANICS	206
5.1	Introduction	206
5.2	What are the current forensic sciences like?	207
5.3	Forensic Biomechanics Genesis	208
5.4	Extreme dynamic loading of organism	219
5.5	Biomechanics of falling from a high	219
	References to Chapter 5	221
6	CRIMINALISTIC BIOMECHANICS	223
6.1	Introduction	223
6.2	Biomechanical analysis of tracks of human locomotion	226
6.2.1	Biomechanical content of tracks of bipedal locomotion	227
6.2.2	Generalized system and matrix of features of a set of tracks of human locomotion	228
6.2.3	The mechanism of the origin of a track	232
6.2.4	Schematic expression of a set of traces of human locomotion	233
6.2.5	Tasks and possibilities of identification by the analysis of tracks	236
6.3	Distribution of forces in human locomotion and their measurement	252
6.3.1	Action forces for rigid surfaces	254
6.4	Some theoretical aspects of the identification of a criminal by his tracks in a dispersive environment	263
6.4.1	Simulation of a track by means of equivalent loading	265
6.4.2	Evaluation of the overall compression by means	

of the compression coefficient	267
6.4.3 The balance of forces and energy during locomotion ..	269
6.5 Methods of measuring the geometric features with biomechanical content for the analysis of tracks of bare feet	280
References to Chapter 6	290
7 FORENSIC BIOMECHANICAL APPLICATION IN CRIMINALISTIC	295
7.1 Introduction	295
7.2 Biomechanical contents of tracks of bipedal locomotion	296
7.3 Assessment of the velocity of locomotion	299
Reference to Chapter 7	303
8 BIOMECHANICS OF EXTREME DYNAMIC LOADING ON ORGANISM	306
8.1 Introduction	306
8.2 Balance of Mechanical Energy at External Head Impact	307
8.3 Experimental Data for Different Head Injuries	310
8.4 Discussion of Results and Conclusion	314
References to Chapter 8	319
9 BIOMECHANICAL ASPECTS OF THE FALLS FROM HEIGHT	320
9.1 Introduction	320
9.2 Material and Methods	320
9.3 Results and Discussion	323
9.4 Horizontal Distance and Height Determination Falling Pattern	325
9.4.1 Material and Methods	325
9.4.2 Results and Discussion	328
References to Chapter 9	338
10 NEW DIRECTIONS OF EXPERIMENT IN FORENSIC BIOMECHANICS	340