

## 4N6XPRT BioMeknx™

4N6XPRT BioMeknx™ is a program designed for the accident investigator. The BioMeknx program incorporates information from a number of different sources, as well as over 30 years of reconstruction experience. 4N6XPRT BioMeknx™ compiles into one source a number of items of information to assist in reconstructing accidents by tying in the injury component more tightly without the need to be a BioMechanics expert. Identification of body part location, body part illustrations, failure threshold limits, definitions of terms, calculation modules for body link lengths, weights, stride lengths, and formulas for other types of calculations are only some of the material included in the program.

To gather into your library the material included in the 4N6XPRT BioMeknx™ program, you would need a minimum of 10-15 Anatomy and Physiology, Human Factors, and Biomechanics books, as well as conduct over 50 hours of internet research. A partial list of the references used in the development of the program is included on our web site and in the program.

### SYSTEM REQUIREMENTS

4N6XPRT BioMeknx™ has been tested on a variety of IBM laptop and desktop clones running Windows 98, ME, NT, 2000, XP or Vista. Upon request, the program can also be compiled to run as a native Linux ( running the Linux Intel Kernal 2.2 or later ) or native MAC program.

A screen resolution of 1024x768 or larger is also required.

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# 4N6XPRT BioMeknx™



Collecting the Biomechanical data of importance to the Accident Investigator into one easily accessible reference location

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## 4N6XPRT BioMeknx - Program Overview

Biomechanics is the application of physics to describe, evaluate, or model living tissue and biological materials. Originally it was the application of the part of physics known as Mechanics to living systems. This is the same portion of physics which is used as the basis for much of accident reconstruction.

Biomechanics is important in many aspects of forensic work from vehicle accident reconstruction to slip-trip-stumble-fall cases. This particular program contains modules containing information on a variety of biomechanics and injury modalities, physical data found in the literature for failure of bone and tissue, calculation modules to evaluate individual specific parameters, and definitions and terminology used in the literature and found in medical reports. This particular program is organized to generally follow the anatomy of the body within each module. That is it starts at the top and works down the anatomical "ladder": Head > Neck > Upper extremities > Torso > Pelvis > Hip & Lower extremities

// Skeletal Bones - Joints - Ligaments by anatomical section

// Muscles and Tendons involved by anatomical section

// Organs by anatomical section, e.g. head > brain; torso > heart, lungs, intestines

// Spine is sufficiently important in accidents to be considered separately, but still following "the ladder"

// The Nervous System is looked at separate from the Brain. It is separately important and follows "the ladder"

// Anthropomorphic data and calculations looks at the whole body and functional data in terms of size and mass.

// Crash Kinematics tends to look at the whole body and particular parts commonly injured

// The Injury Scales evaluate injuries again following "the ladder" within a scale

// Basic physics applies motion mechanics to the body while following "the ladder" and many of the concepts are applied throughout

It is important for the user to remember:

(A) these modules are NOT the "Be All and End All" of information on a topic,

(B) many volumes have been written on each of these topics,

(C) differing values may be found in the literature for a particular physical property, depending on the researcher, the equipment used, and the research objective.

(D) all individuals will vary from the next in specific values. Age and health will give differing values for a specific tissue.

(E) Using the information contained here DOES NOT, IN IT SELF, QUALIFY you as a Biomechanics expert witness in the courts! While the data has been accepted in the California courts, this was done ONLY WHEN the witness demonstrated adequate background for the proper use of this data in a particular case.

However, the data does provide a reasonable starting place for calculations and evaluating the information in a particular forensic case, especially when the party at issue is not available, or certain testing would be illegal (e.g. determining the fracture force of a living human skull)!

### Introduction: Overview, Fractures

Skull - Zygomatic Arch, Mandible

Vertebrae, General

1. Cervical
2. Thoracic
3. Lumbar
4. Sacrum

Clavicle or Collar Bone

Shoulder: Acromion, Scapula

Upper Extremity: Arm, Hand

1. Humerus
2. Radius, Ulna
3. Elbow (a Joint)
4. Hand and Wrist

Sternum, Ribs

Pelvis

Lower Extremity: Leg, Knee, Ankle

1. Femur Head, Neck, Pelvic Socket
2. Femur Shaft
3. Knee, Patella, ACL
4. Fibula
5. Tibia
6. Ankle
7. Foot

### Biomechanics of the Spine

Spinal Column

Some Physical Properties of Vertebrae

Spinal Inter-Disk Height - Cervical area

Spinal Inter-Disk Height - Lumbar

Disk Structure and Failure Loads

Lumbar Disk Pressure Formulas

Lumbar Disk Pressure Calculator

Disc Shear Load Calculator

Disc Herniations - Bulges - Dessiccation

Some Tests Used For Evaluation of Injury

Head and Neck Normal Range of Motion

Trunk Normal Range of Motion

### CALCULATIONS

Segment Length as % of Total Height

Segment Center of Mass

Segment Weight as % of Total Weight

BioMass Index - BMI Calculator

Radii of Gyration and Moment of I about an Axis

CALCULATE ESTIMATED MAXIMUM WALKING SPEED

Standing or Walking Visual Field Calculator

Obstruction in Field of View Calculator

### DATA

Adults - Published Standing Height and Reach Ranges

Adults - Published Sitting Height and Reach Ranges

Children - Published Standing Height and Reach Ranges

Children - Published Sitting Height and Reach Ranges

Body Segment Range of Motion

Body Types

Walking Info

Metric-Imperial Conversions

### Anatomical Concepts and Terminology

Muscles - Smooth, striated, pennation

Tendon Information - Data

Cervical - Head - Neck - Jaw

Shoulder System - Rotator cuff

Upper Extremities - Arm - Wrist - Hand

Thoracic - Upper Trunk - Spine

Lumbar - Lower Trunk - Spine

Lower Extremities - Pelvis - Hips - Leg - Ankle - Foot

General Muscle Info and Data

### Blunt Force Abdominal Trauma - A Review

Brain Regions and Functions

Vision - Concepts and Applications

Hearing - Sound Level Range

Ear and Auditory System

Smell and Taste - Nose-Tongue-Mouth

Heart and Aorta

Liver

Kidney

Lung

Spleen

Blood and Blood Vessels

Blood Pressure

Misc. Biophysical Data

### Nerve Sizes, Failure Data

Nerve Roots vs Disc Position

Nerve Roots and Functional Regions

Dermatomes

Spinal Chord and Injury Effects

Sympathetic Response

Brief Description of Pain

### Skin - Structure

Skin - Tear Strength

Skin Friction Values


Bruises - Age Of and Color

Hair - Structure


Langer Lines

4N6XPRT BIOMEKNX  
Vers. 2.0


MAIN MENU




BONES & JOINTS




MUSCLE & TENDON




BRAIN & ORGANS




SPINE




NERVES




SKIN & HAIR



ANTHROPOMETRICS



INJURY SCALES



CALCULATIONS

AIS80 - Abbreviated Injury Scale 1980 versions

AIS90 - Abbreviated Injury Scale 1990 version

ISS - Injury Severity Scale

GCS - Glasgow Coma Scale

MISS - Modified Injury Severity Scale

POD - Probability of Death

TS, RTS, PTS - Trauma Score, Revised TS, Pediatric TS

CRAMS - Circulation, Respiration, Abdomen, Motor, and Speech

TRISS - Trauma score + Injury Severity Score

MESS-MESI - Mangled Extremity Severity Score Syndrome Indx

OIC - Occupant Injury Classification

IPR\_MIPR - Injury Priority and Multi-Injury Priority Ratings

HIC - Head Injury Criterion

HARM Scaling and Body Component Interactions

Glossary of Anatomical and Injury terms

### DATA

### CALCULATIONS

Segment Length as % of Total Height

Segment Center of Mass

Radii of Gyration and Moment of I about an Axis

Standing or Walking Visual Field Calculator

CALCULATE ESTIMATED MAXIMUM WALKING SPEED

IMPACT SPEED on SLIP, TRIP, STUMBLE, or CRUMPLE

Obstruction in Field of View Calculator

Segment Weight as % of Total Weight

BioMass Index - BMI Calculator

### MAIN MENU

ABOUT

# 4N6XPRT Systems

Expert System Software for Litigation

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A handwritten signature in black ink that reads 'Daniel W. Vomhof III'.

Daniel W. Vomhof III  
General Manager/Technical Support