



Ariel Dynamics Inc. Media Library - Video

History of Biomechanics



Code	adi-vid-01164
Title	History of Biomechanics
Subtitle	Part 1 - The First Biomechanical System in the World
Subject	APAS;Biomechanics;History;Performance Analysis
Duration	00:10:00
URL	https://arielweb.com/videos/play/adi-vid-01164
Date	2010-12-09 00:00:00
Label	Approved
Privacy	Public

Presentation Synopsis

This presentation is the first part of a three-part series on the history of biomechanics, focusing on its application in the Olympics. The presenter begins by discussing the current use of biomechanics in the Olympics, then traces back to its historical origins.

The presentation explains how biomechanics is used to analyze athletes' movements using 3D modeling techniques. This involves the use of multiple cameras to capture movements, which are then digitized and analyzed. This technique can be applied to any motion activity, such as gait analysis, and can help identify different joint centers and calculate stresses on the joints.

The presenter then delves into the history of biomechanics, starting with Leonardo da Vinci, who integrated anatomical and mechanical systems. Other contributors to the field include Isaac Newton, who provided the mathematical background, and Buelly, who integrated the human body with biomechanics.

The presenter also shares his personal journey in the field of biomechanics, from representing Israel in the Olympics to receiving a scholarship at the University of Wyoming and earning a doctorate degree at the University of Massachusetts. He discusses his early work in biomechanics, including manual tracing and calculations, and writing his own programs for analyzing forces at different joints.

The presentation concludes with a highlight of the first use of biomechanics in the Olympics in Mexico City, featuring Bob Beeman's record-breaking long jump. The second part of the series will continue from this point.

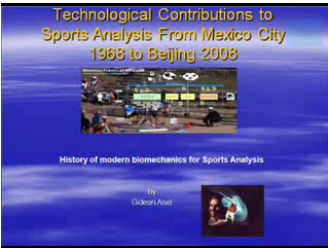
Model Id: gpt-4-0613

Created on: 2023-09-19 03:00:25

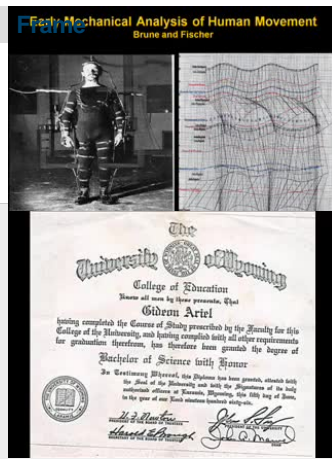
Processing time: 00:00:25.0890000

Total tokens: 1420

Audio transcription

Frame	#	Time	Spoken text
	0.	00:00:00	<i>This presentation on the history of biomechanics is a part of three YouTube presentations that will show how we develop the most sophisticated biomechanical system in the world.</i>
	1.	00:00:15	<i>It's used in the Olympics and I will start with the present way, how we using it and go to the historical time, how we started it all working from scratch.</i>
	2.	00:00:30	<i>Listen to the crowd.</i>
	3.	00:00:35	<i>This crowd are rising to these men.</i>
	4.	00:00:40	<i>150 meters remaining at the era of the Olympic champion.</i>
	5.	00:00:45	<i>Can't taste our world championship gold medal.</i>
	6.	00:00:48	<i>Is that a smile in the space if he runs the final hundred?</i>
7.	00:00:51	<i>He was trying to come back on.</i>	

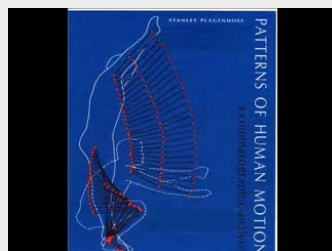
Frame	#	Time	Spoken text
	8.	00:00:53	Can't do it. I don't think he has a space but he's trying very hard when a magnificent finish.
	9.	00:00:59	A barrow to the finish line and the Simon Meela.
	10.	00:01:04	The Olympic champion of our world champion.
	11.	00:01:07	Can't be a
	12.	00:01:51	strike.
	13.	00:01:56	As the race to the finish line.
	14.	00:02:03	Can't be a
	15.	00:02:06	strike.
	16.	00:02:19	Can't be a
	17.	00:02:35	strike.
	18.	00:02:39	Using a model technique in a 3D we can calculate three dimensions with multiple cameras all the way to nine cameras.
	19.	00:02:48	That's allowed us to have automatic digitizing use markers.
	20.	00:02:52	So it is joined actually have a marker captured by the computer automatically and then trace all automatically.
	21.	00:03:02	So you can see the movement of the different joint centers.
	22.	00:03:06	In this case we're using markers but you can also have a marker system.
	23.	00:03:12	In this case you have to have a manual digitizing and it will be assisted by the computer.
	24.	00:03:18	The result of the digitizing is three dimensional figures that you can see here in the roaring.
	25.	00:03:26	Going only in 3D.
	26.	00:03:29	We can also apply the same technique to any activity of motion.
	27.	00:03:34	Like for example at gate in gate analysis here using force platform or without force platform using multiple cameras.
	28.	00:03:43	We can identify the different joint centers and calculated different stresses on the joints we've shown here in the graphs.
	29.	00:03:51	You can play what if game by changing certain joint to certain position.
	30.	00:03:56	So in functional capacity evaluation it's helping to determine injuries.
	31.	00:05:04	This development started long time ago.
	32.	00:05:29	I would say with Leonardo da Vinci which integrated the anatomical system with mechanical systems
	33.	00:05:37	and created the foundation for understanding the human body.
	34.	00:05:43	And of course other investigators contribute Isaac Newton with his mechanical laws.
	35.	00:05:49	We're one of the essential person to create the whole mathematical backgrounds.
	36.	00:05:53	And others like Leibniz and others that there's no reason to mention them here.
	37.	00:05:58	One that I want to mention is Buelly which actually integrated the human body with biomechanics and calculated the stresses
	38.	00:06:13	and how level system working on the body was probably the first biomechanist.
	39.	00:06:21	And then Bruno and Fisher in the late 19th century which did all kind of calculation actually use stick figures.
	40.	00:06:29	Probably one of the first stick figures to describe the human body.
	41.	00:06:36	And of course my bridge which I'll discuss in my second episode is his contribution.
	42.	00:06:42	Being a disk destroyer representing Israel in two Olympics.



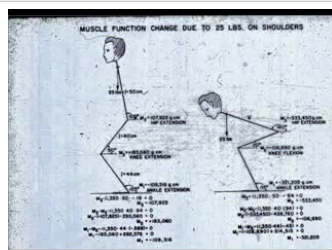
- # **Time** **Spoken text**
- 43. **00:06:46** *Here I'm carrying the flag in Tokyo and also I represented Israel in the shot in the disk in Rome Olympics.*
- 44. **00:06:54** *I received a scholarship in University of Wyoming which allowed me to come to United States.*
- 45. **00:07:00** *Graduated with honor from the undergraduate degree.*
- 46. **00:07:04** *I got an assistantship in University of Massachusetts working toward my doctorate degree.*
- 47. **00:07:09** *In Massachusetts I learned a lot, beautiful location, great university.*
- 48. **00:07:15** *And I got a course a book called by Dyson the mechanics of athletics for the first time.*
- 49. **00:07:22** *I saw how mechanical principles are integrated with sport activity and I got an idea for the future coach.*



- 50. **00:07:31** *I started with simple analysis.*
- 51. **00:07:34** *The first one was in the Journal of Ergonomics on analysis of the effect of the knee joint angle on the Harvard step desk*
- 52. **00:07:43** *which was published was my first publication in 1969.*
- 53. **00:07:46** *Here is Anne making all kind of calculation Dr. Ann Penny.*
- 54. **00:07:51** *And here I'm doing calculation on the arm strength.*



- 55. **00:07:56** *And of course my professor in the university's ten plug-in of is the one introduced me to modern biomechanics.*
- 56. **00:08:02** *Here we were doing the tracing using mirrors and all the tracing were done by hand.*
- 57. **00:08:08** *So all the calculation were with protractor and with pencil and a paper.*
- 58. **00:08:13** *And then we created the stick figures.*
- 59. **00:08:16** *We also wrote our own programs here as a kinetic program that can analyze forces at the knee joints and the hip joints*




- 60. **00:08:25** *and the ankle joint.*
- 61. **00:08:26** *You're representing in another publication that I had one of the original one.*
- 62. **00:08:31** *And then we had other publication on the effect of the different velocity on the high jump and javelin throwing*
- 63. **00:08:39** *all the kinematic parameters.*
- 64. **00:08:41** *And for the first time biomechanics were using the Olympics in Mexico City.*



- 65. **00:08:47** *This team hears the record has stood.*
- 66. **00:08:52** *The longest jump ever made by Bob Beeman with the drama and the dream.*
- 67. **00:08:58** *Although Mexico City October 18 1968.*
- 68. **00:09:03** *Bob Beeman starts his approach slowly gathering momentum.*
- 69. **00:09:07** *He strives stretching out 19 of them.*



- 70. **00:09:10** *The last step long and piston light.*
- 71. **00:09:14** *His right foot pounding the takeoff board perfectly driving himself up, up, up.*
- 72. **00:09:20** *His mind goes blank.*
- 73. **00:09:22** *His hearing deserts him.*
- 74. **00:09:24** *Turns in the air it seems forever.*

Frame	#	Time	Spoken text
	75.	00:09:27	<i>When he comes down his heels strike the sand with such force he bounds on one hop like an airplane harshly landed right out of the pit.</i>
	76.	00:09:38	<i>Bob Beeman has jumped 29 feet two and one half inches.</i>
	77.	00:09:42	<i>22 inches beyond the existing world record.</i>
	78.	00:09:45	<i>Arguably and conceivably the most spectacular individual achievement in the history of all sports.</i>
	79.	00:09:54	<i>To be continued in episode number two.</i>

This PDF-document has been auto-generated from a video file by arielweb-ai-bot v1.2.2023.0926 on 2023-09-28 03:45:06 without human intervention. In case of errors or omissions please contact our aibot directly at ai@macrosport.com.

Video filename: **adi-vid-01164-history-of-biomechanics-1024kbps.mp4**

Copyright Disclaimer

The content and materials provided in this document are protected by copyright laws. All rights are reserved by Ariel Dynamics Inc. Users are prohibited from copying, reproducing, distributing, or modifying any part of this content without prior written permission from Ariel Dynamics Inc. Unauthorized use or reproduction of any materials may result in legal action.

Disclaimer of Liability

While every effort has been made to ensure the accuracy of the information presented on this website/document, Ariel Dynamics Inc. makes no warranties or representations regarding the completeness, accuracy, or suitability of the information. The content is provided "as is" and without warranty of any kind, either expressed or implied. Ariel Dynamics Inc. shall not be liable for any errors or omissions in the content or for any actions taken in reliance thereon. Ariel Dynamics Inc. disclaims all responsibility for any loss, injury, claim, liability, or damage of any kind resulting from, arising out of, or in any way related to the use or reliance on the content provided herein.