

HUMAN ENGINEERING: PROSTHETICS AND ORTHOTICS

By:

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PROSTHETICS AND ORTHOTICS

- Overview
- History
- Devices
- Challenges of the Disabled
- Emerging Technologies
- Final Thoughts

OVERVIEW

- Prosthetics = Replacing
- Orthotics = Straightening



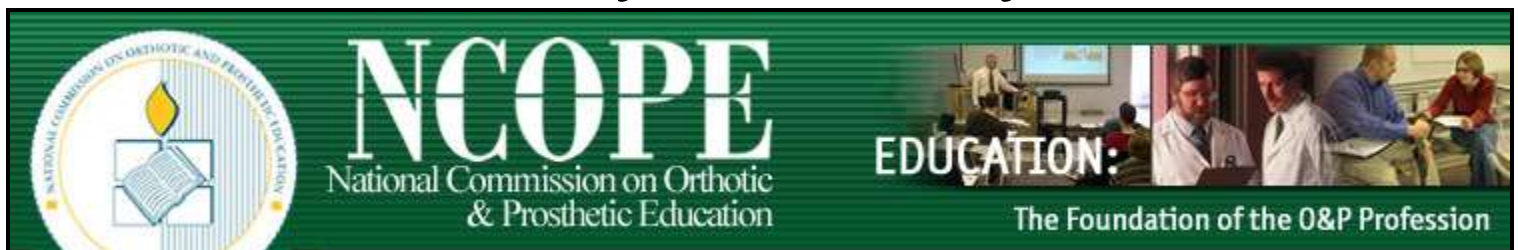
FAMILY BUSINESS

- Norell family has been building functional external fixators since the late 1950's.
- Late 1960's is when I got introduced to the profession. What I made then is now pre-fabricated today, as the field is continuously evolving.



PROGRAMS ACCREDITED BY NCOPE

- NCOPE- National Commission on Orthotic and Prosthetic Education
- Currently 9 universities that offer P and O Practitioner Programs, 4 that offer technician programs, and 1 up for Candidate for Accreditation.
- California State University Dominguez Hills is the only university in California.



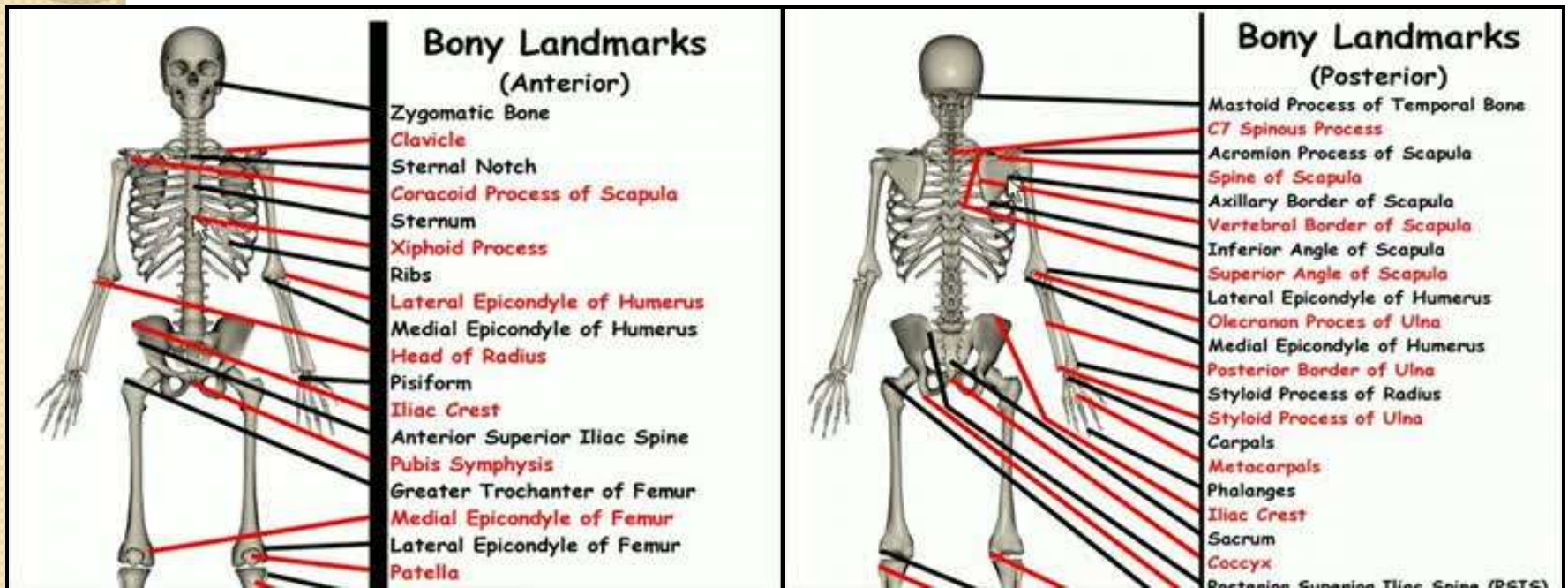
BONY LANDMARKS



BONY LANDMARKS

- Bony landmarks- distinguishing features found on the bones of the skeletal system.
- Each bone has at least one or two “landmarks” to distinguish that bone from others.
- Used regularly by therapists, prosthetists, orthotists, and other medical professionals.

BONY LANDMARKS



It's estimated that one out of every 200 people has had some kind of amputation, according to the Amputee Coalition of America. [ACA]



LIFE'S CHALLENGES

- Historically man's challenge through life has been accompanied by trauma, disease, and congenital abnormalities directly associated with the need for prosthetics and orthotics.



HISTORY

- Blacksmiths and armor makers were the first orthotists, then ship builders and metal workers used their expertise to develop more detailed devices.



HISTORY- EARLY YEARS

- 3500 - 1800 BCE- The first recorded prosthesis was found in the book of Vedas written in Sanskrit, India.

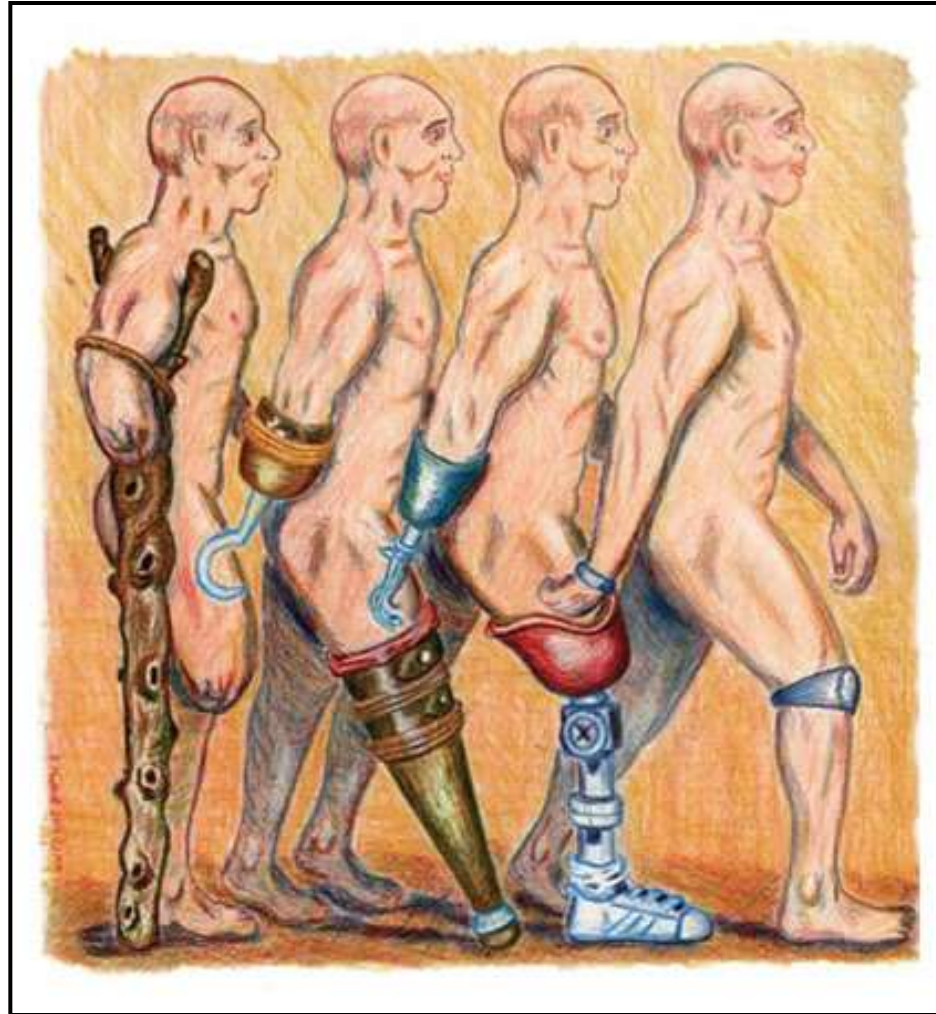


HISTORY- EARLY YEARS

- 484 BCE- Herodotus, wrote about a Persian imprisoned soldier, who performed an amputation on his own foot to escape from the stocks.



Evolution of Prosthetic Devices



EARLY PROSTHETIC DEVICES



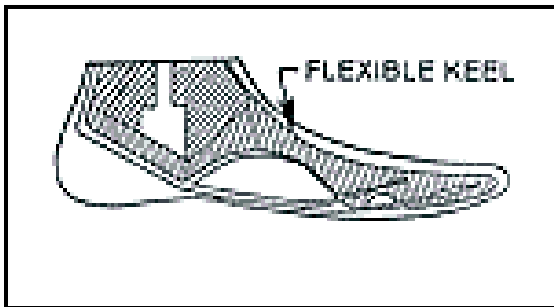
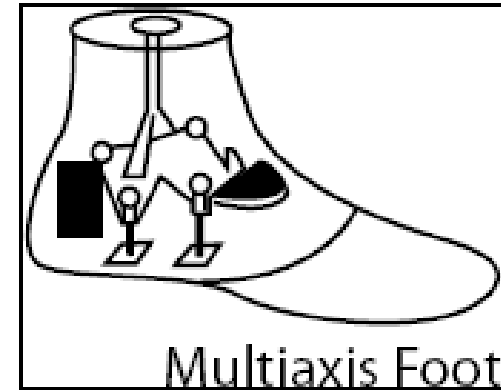
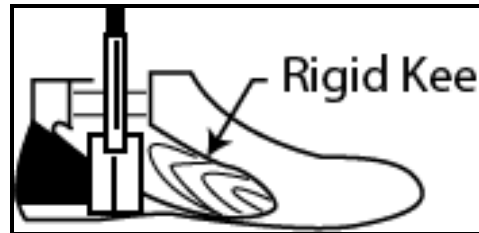
TURN OF THE CENTURY BREAKTHROUGHS

- 1960's- Research efforts into human locomotion biomechanics and the development of new material and devices.
- 1970's- Infancy of vacuum forming sheet plastic. Experimentation with Kevlar, carbon, and fiberglass in thermo-setting applications of resins.
- 1980's- Continuing introduction of new materials and methods. The rapid evolution was seen as a changing discipline.
- 1990's- Georgia Tech offered entry level graduate degree program in prosthetics and orthotics.

PROSTHETIC FEET

- S.A.C.H.- Solid Ankle Cushion Heel
- Single -Axis Design
- Multi-Axis Design
- Energy Storing and Response Foot (ESR)
- Flex Type Foot

PROSTHETIC FEET



HISTORY OF SOCKET DESIGNS

- **Plug Socket-** soft tissue around groin supported body weight.
- **Quadrilateral Socket-** socket divided into 4 walls.
- **Ischial-Ramal Containment Socket (IRC)-** stabilizes pelvis and femur by controlling the ischium.

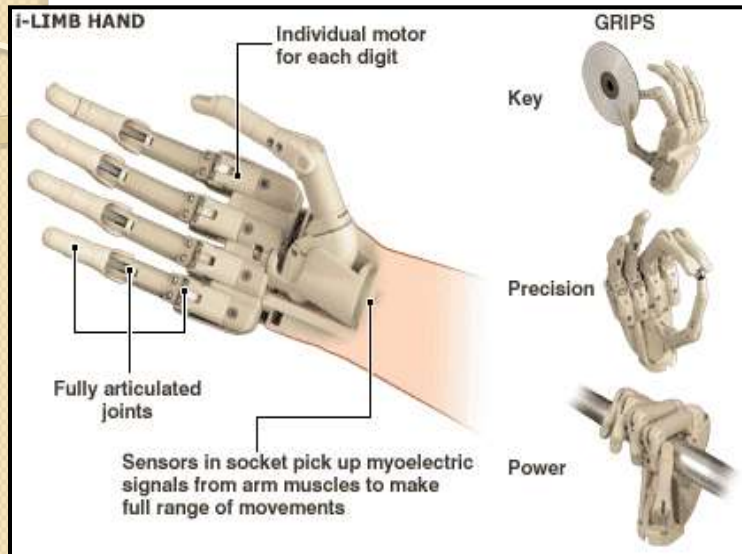
SOCKET DESIGNS



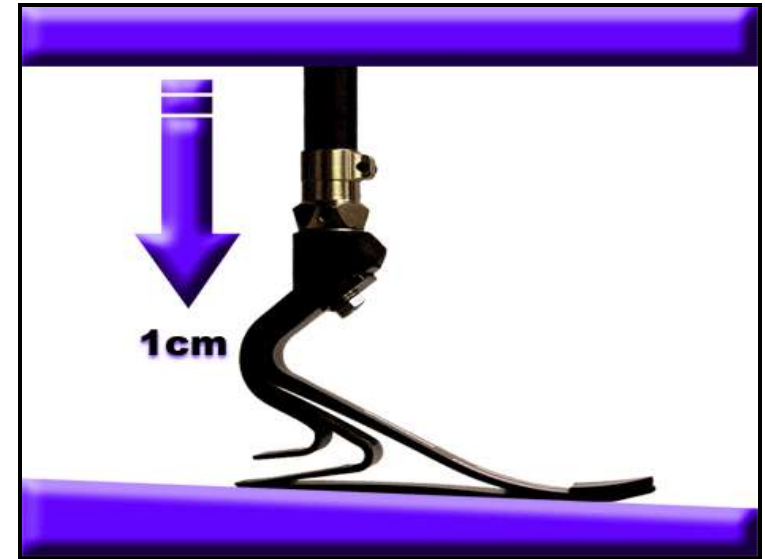
EMERGING TECHNOLOGIES

- Direct Bone Attachments
- Robotic Limbs
 - Boston Arm- movement on 5 axes
 - i-Limb- 5 individually powered digits
- John's Hopkins University's Applied Physics Laboratory
 - Developed a prosthetic arm prototype for the Defense Advanced Research Projects Agency (DARPA) that can be controlled by a human brain.

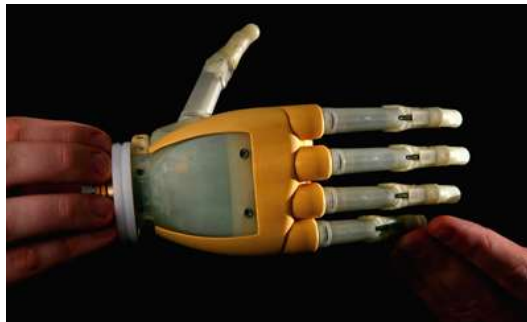
MODERN PROSTHETIC DEVICES



I-Limb



Renegade Foot



C-Leg

CHALLENGES OF THE DISABLED

1. **Socializing-** passive approach
2. **Support-** independence or dependence
3. **People's attitudes-** makes life difficult
4. **Repeated past rejections-** “snowball effect”

CHALLENGING IDEAS

1. **Small ideas or steps-** short range goals that can be easily reached.
2. **Take the first steps-** Feel confident and visualize, then attempt and accomplish.
3. **Focus on can do-** get rid of past rejections and take the risk. Use a non-passive approach.
4. **Don't let environment get in the way-** get involved in mainstream society, and enjoy the same life experiences as others.
5. **Understanding differences-** knowing that people are more alike than different. Being sensitive to the situation .

MOTIVATION IS KEY

- Motivation and support are a must!



PERCEPTION IS KEY

- Perception is 90% real, just do it!



PARADISE



CULTURE



TRANSPORTATION



BOHOL, PHILIPPINES



MEDICAL MISSION



ASSISTANT HOWARD



COUNSELOR CAFE



MEDICATION FROM AMSTERDAM



ILLNESS AND DISEASE



UPPER EXTREMITY PROSTHETICS



CAN'T HELP EVERYONE





Thank you

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