

ISSUES OF HUMAN INTERFACE DESIGN

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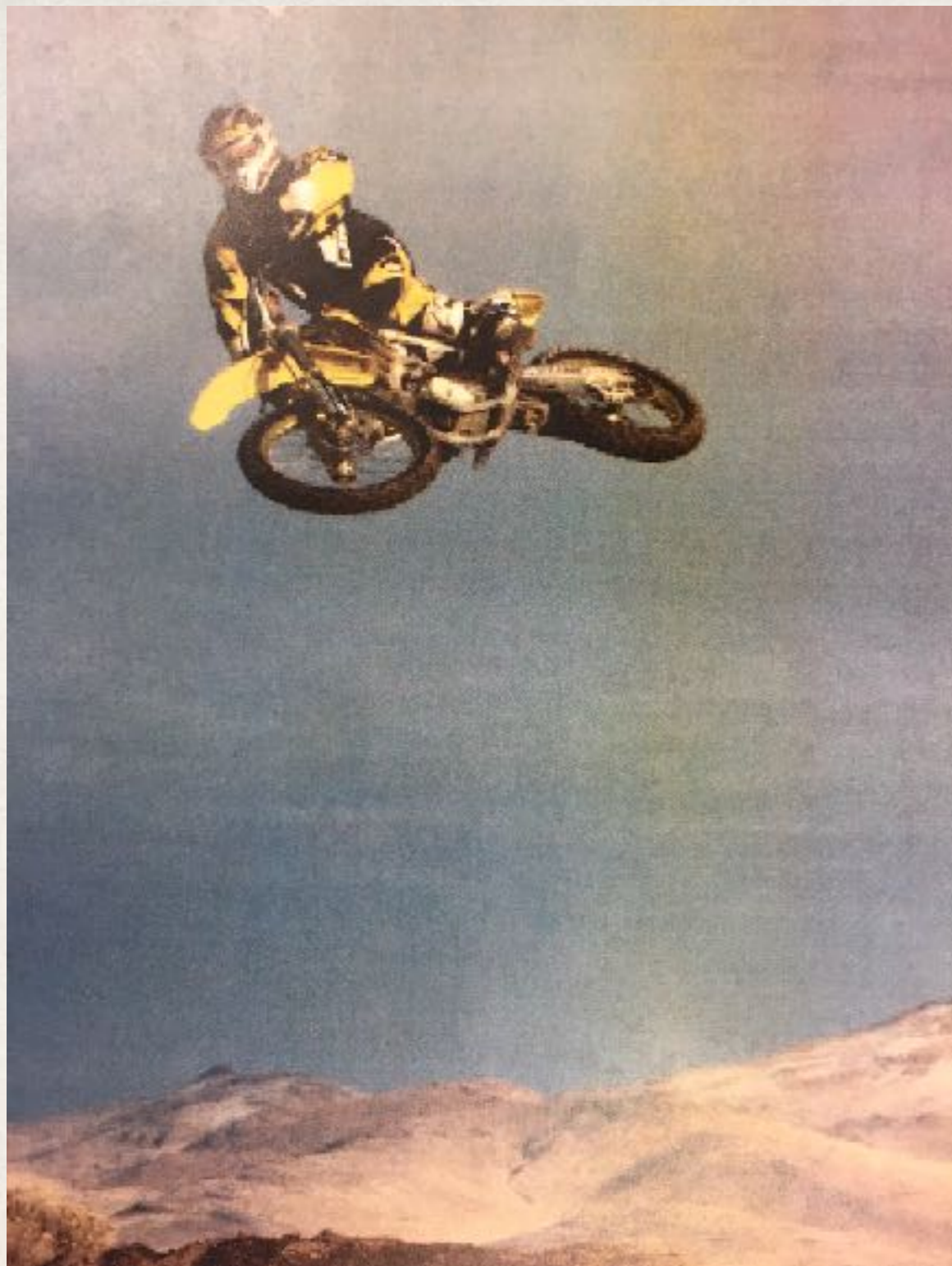
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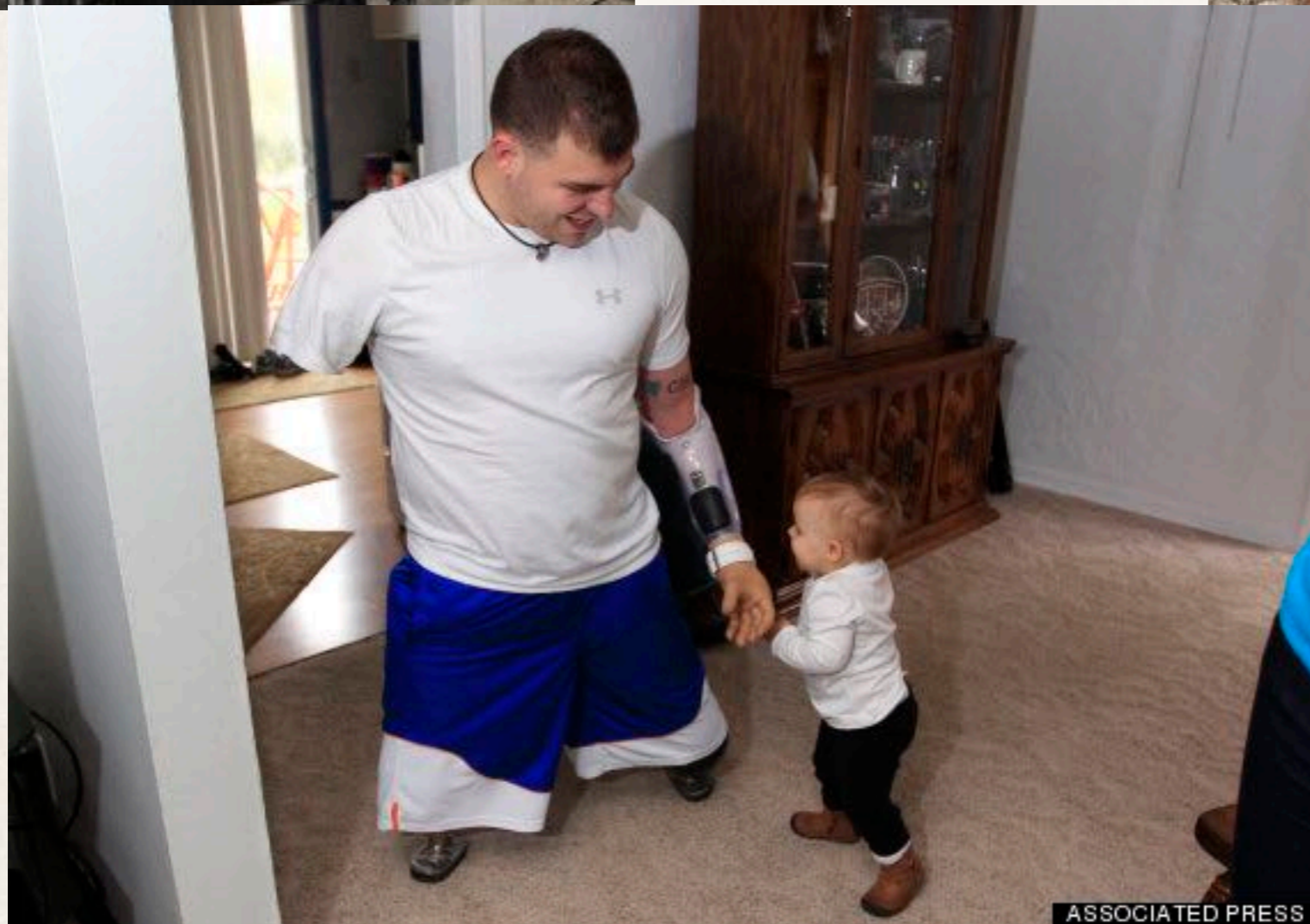
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Grant Research Support from:
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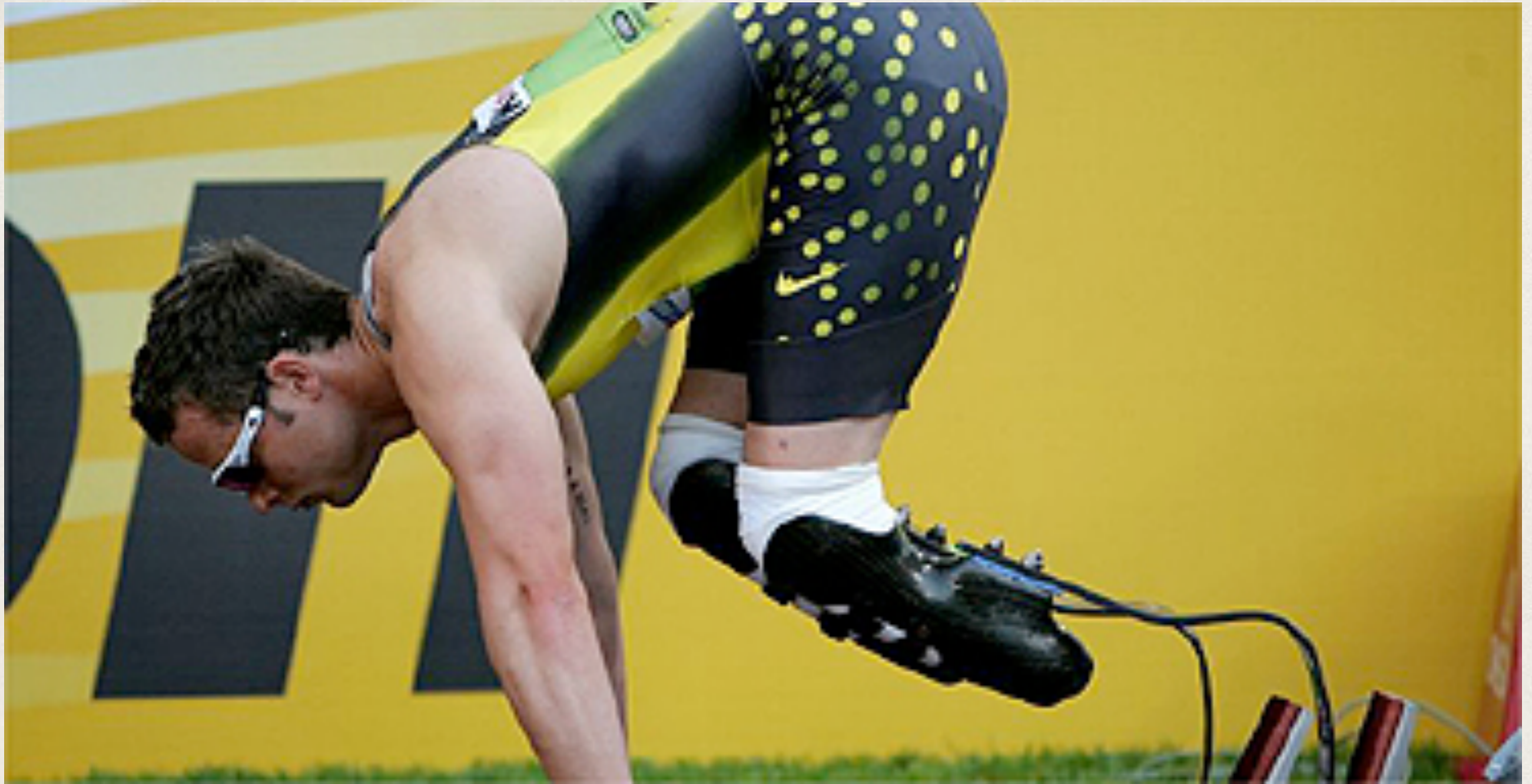


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SECTION ONE

The older I get the less I know.



Better than human?

How do you design a shoe?



FIVE C'S

- Comfort
- Cosmesis
- funCtion
- Cost
- Cool



Better than Human?



Knee cuffs

Advanced Binding

A-frame

Spring feet

Replaceable Foot pads





COMFORT

- ✻ Transference of pressure
- ✻ No “noxious” stimuli (noise, vibration etc)
- ✻ Heat
- ✻ Nuisance factor
 - ✻ easy to put on and take off
 - ✻ not too bulky
- ✻ Weight
- ✻ Sensitivity of skin or nerve

COMFORT

UN-
* What makes something comfortable?

COMFORT IS ILLUSIVE

- ✻ What may be “comfortable” one minute may not be the next.....

FUNCTION

- ✪ Is it a device that reliably does what it is intended to do?

FUNCTION

✻ Is there a device that can do everything?





COSMESIS



What is cosmetic?



COSMESIS

- ☀ How do we perceive ourselves?
- ☀ How do changes to our body affect our perception of cosmesis?

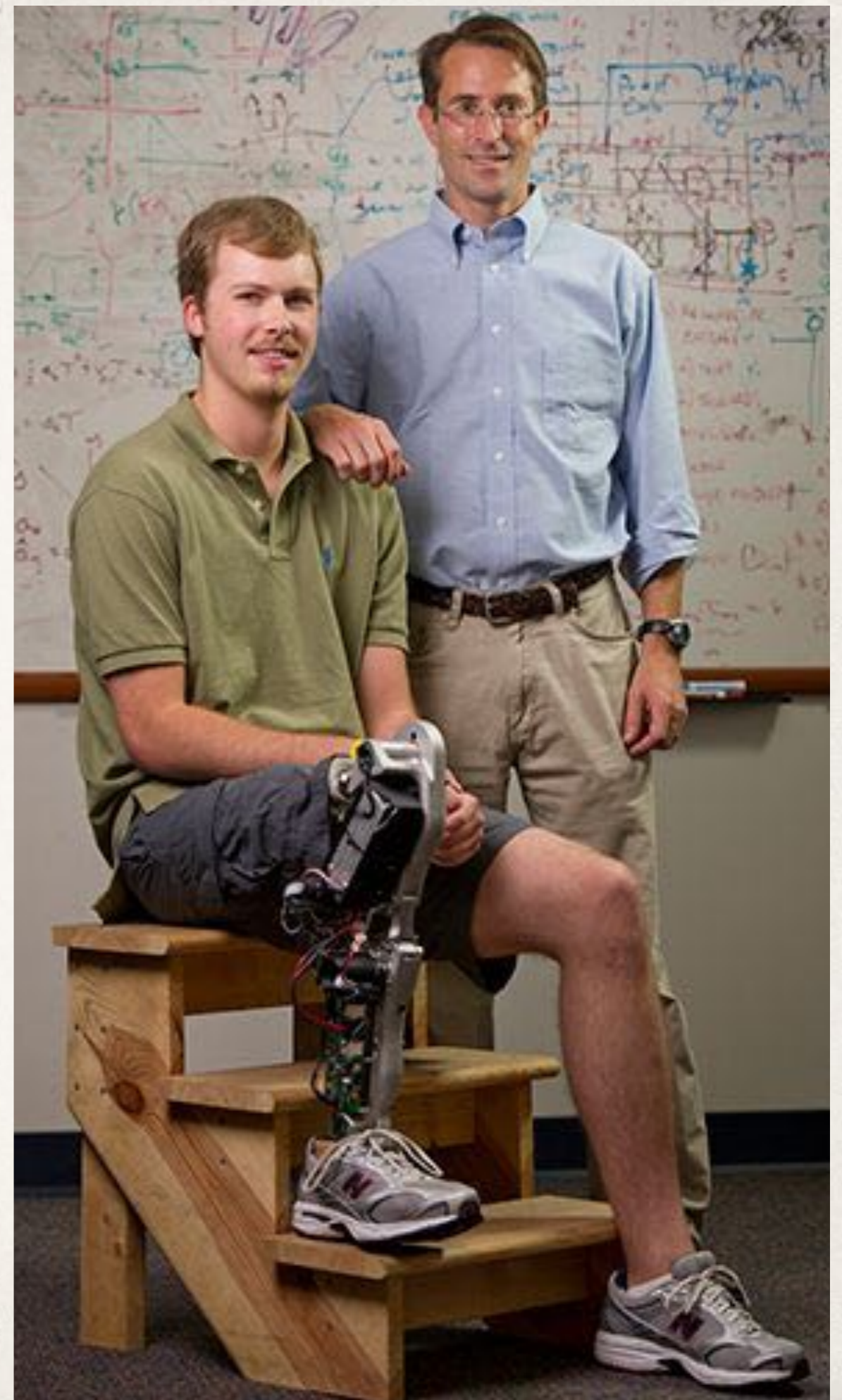






Cost

- What is it worth to the consumer and...
- If it costs way more,
does it provide a
proportional
improvement in
comfort, function,
cosmesis or cool?





BIONIC







COOL

How do
“things” interact
with humans?



glasses

	Regular glasses	Self Adjusting
Comfort	✓	
Function	✓	✓
Cosmesis	✓	
Cost	✓	
Cool		✓

SECTION TWO

- ❖ There are people everywhere that use sticks to eat, perhaps we should 3-D print them forks.

SECTION TWO

- ❖ Just because we CAN, doesn't mean we SHOULD



*the celebrated Artificial Limbs, with India
Rubber Hands and Feet.*

PATENT

A.A. MARKS,

MANUFACTURER OF

ARTIFICIAL LIMBS

575. BROADWAY,
NEW YORK

OPPOSITE THE METROPOLITAN HOTEL

The central illustration is an ornate, Art Nouveau-style frame containing two artificial limbs: a hand on the left and a foot on the right. A ribbon at the top of the frame reads 'PATENT'. The name 'A.A. MARKS' is prominently displayed in a decorative font above the main text. The address '575. BROADWAY, NEW YORK' is written in a stylized font, and 'OPPOSITE THE METROPOLITAN HOTEL' is at the bottom of the frame.

**First Premium (GOLD MEDAL,) awarded by the
American Institute, 1865, as the BEST.**

*States Army, to furnish Soldiers with Arti-
ficial Limbs, FREE OF CHARGE.*

To A. A. Marks
701 Broadway
New York, N. Y.
UNITED STATES OF AMERICA.

Received the only Grand Prize for Artificial Limbs
at the Worlds Fair, St. Louis, 1904.

ORDER SHEET FOR ARTIFICIAL LEGS AND ARMS

TO BE FILLED ACCORDING TO DIRECTIONS AND THEN FORWARDED TO
A. A. Marks, 701 Broadway, New York, U. S. A.

Section I. Directions for Taking Measurements and Diagrams of Single Leg Amputations (Right or Left)

ONE LEG AMPUTATED IN OR ABOVE THE KNEE
Distances and circumferences to be taken with a tape measure in the way indicated by illustrations in Section II. The figures to be placed on this cut.

SOUND LEG


- O. Distance from body to ankle to foot, taken as shown in Cut No. 4.
- Circumference of thigh close to body, taken as shown in Cut No. 4.
- Circumference of thigh 2 inches below body.
- Circumference of thigh 4 inches below body.
- Circumference of thigh 6 inches below body.
- Circumference of thigh 8 inches below body.
- Circumference of thigh just above knee cap.
- Circumference of knee around center of knee cap.
- Circumference of leg just below knee cap.
- Circumference of calf.
- Circumference of ankle just above joint.
- Circumference of heel and instep.
- Circumference of foot at lower instep.
- Circumference of foot at toe joint.
- Length of foot.
- Distance from top of knee to foot, taken as shown in Cut No. 6.
- X. Distance from substitute of knee to foot, taken as shown in Cut No. 7.

AMPUTATED LEG

- P. Distance from body to substitute of foot, taken as shown in Cut No. 1.
- Circumference of stump close to body, taken as shown in Cut No. 2.
- Circumference of stump 2 inches below body.
- Circumference of stump 4 inches below body.
- Circumference of stump 6 inches below body.
- Circumference of stump 8 inches below body.
- Q. Distance from end of stump to knee, taken as shown in Cut No. 3.

After taking these measurements, see diagrams and profiles of sound and amputated leg, as shown in Section III.

Answer all the questions asked in Section VI.



CUT No. 1

ONE LEG AMPUTATED BELOW THE KNEE, OR FOOT AMPUTATED AT THE ANKLE, OR INSTEP
Distances and circumferences to be taken with a tape measure in the way indicated by illustrations in Section II. The figures to be placed on this cut.

SOUND LEG

- O. Distance from body to ankle to foot, taken as shown in Cut No. 4.
- Circumference of thigh close to body, taken as shown in Cut No. 4.
- Circumference of thigh 2 inches below body.
- Circumference of thigh 4 inches below body.
- Circumference of thigh 6 inches below body.
- Circumference of thigh 8 inches below body.
- Circumference of thigh just above knee cap.
- Circumference of knee around center of knee cap.
- Circumference of leg just below knee cap.
- Circumference of calf.
- Circumference of ankle just above joint.
- Circumference of heel and instep.
- Circumference of foot at lower instep.
- Circumference of foot at toe joint.
- Length of foot.
- W. Distance from top of knee to foot, taken as shown in Cut No. 6.
- X. Distance from substitute of knee to foot, taken as shown in Cut No. 7.

AMPUTATED LEG

- P. Distance from body to substitute of foot, taken as shown in Cut No. 1.
- Circumference of stump close to body, taken as shown in Cut No. 2.
- Circumference of stump 2 inches below body.
- Circumference of stump 4 inches below body.
- Circumference of stump 6 inches below body.
- Circumference of stump 8 inches below body.
- F. Circumference just above knee cap.
- G. Circumference of knee around center of knee cap.
- H. Circumference of stump just below knee cap.
- I. Circumference of stump 2 inches below knee cap.
- J. Circumference of stump 4 inches below knee cap.
- K. Circumference of stump 6 inches below knee cap.
- L. Circumference of stump 8 inches below knee cap.
- M. Circumference of stump 10 inches below knee cap.
- N. Q. Distance from substitute of knee to foot, taken as shown in Cut No. 3.
- Q. Distance from end of stump to foot, taken as shown in Cut No. 1.

After taking these measurements, see diagrams and profiles of sound leg and amputated leg, as shown in Section III.

Answer all the questions asked in Section VI.



CUT No. 2

ONE LEG AMPUTATED BELOW THE KNEE, LEAVING A VERY SHORT OR CONTRACTED STUMP, REQUIRING THE USE OF A KNEE-BEARING LEG
Distances and circumferences to be taken with a tape measure in the way indicated by illustrations in Section II. The figures to be placed on this cut.

SOUND LEG

- O. Distance from body to ankle to foot, taken as shown in Cut No. 4.
- Circumference of thigh close to body, taken as shown in Cut No. 4.
- Circumference of thigh 2 inches below body.
- Circumference of thigh 4 inches below body.
- Circumference of thigh 6 inches below body.
- Circumference of thigh 8 inches below body.
- Circumference of thigh just above knee cap.
- Circumference of knee around center of knee cap.
- Circumference of leg just below knee cap.
- Circumference of calf.
- Circumference of ankle just above joint.
- Circumference of heel and instep.
- Circumference of foot at lower instep.
- Circumference of foot at toe joint.
- Length of foot.
- W. Distance from top of knee to foot, taken as shown in Cut No. 6.
- X. Distance from substitute of knee to foot, taken as shown in Cut No. 7.

AMPUTATED LEG

- P. Distance from body to substitute of foot, taken as shown in Cut No. 1.
- Circumference of stump close to body, taken as shown in Cut No. 2.
- Circumference of stump 2 inches below body.
- Circumference of stump 4 inches below body.
- Circumference of stump 6 inches below body.
- Circumference of stump 8 inches below body.
- F. Circumference just above knee cap.
- G. Circumference of knee around center of knee cap.
- H. Circumference of leg just below knee cap.
- I. Circumference of stump 2 inches below knee cap.
- J. Circumference of stump 4 inches below knee cap.
- K. Circumference of stump 6 inches below knee cap.
- L. Circumference of stump 8 inches below knee cap.
- M. Circumference of stump 10 inches below knee cap.
- N. Q. Distance from top of stump to foot, taken as shown in Cut No. 3.
- Q. Distance from substitute of knee to foot, taken as shown in Cut No. 1.

After taking these measurements, see diagrams and profiles of sound leg and amputated leg, as shown in Section III.

Answer all the questions asked in Section VI.



CUT No. 3

Section II. Illustrations Showing the Manner of Measuring



Section III. Directions for Taking Diagrams and Profiles of Single Leg Amputations

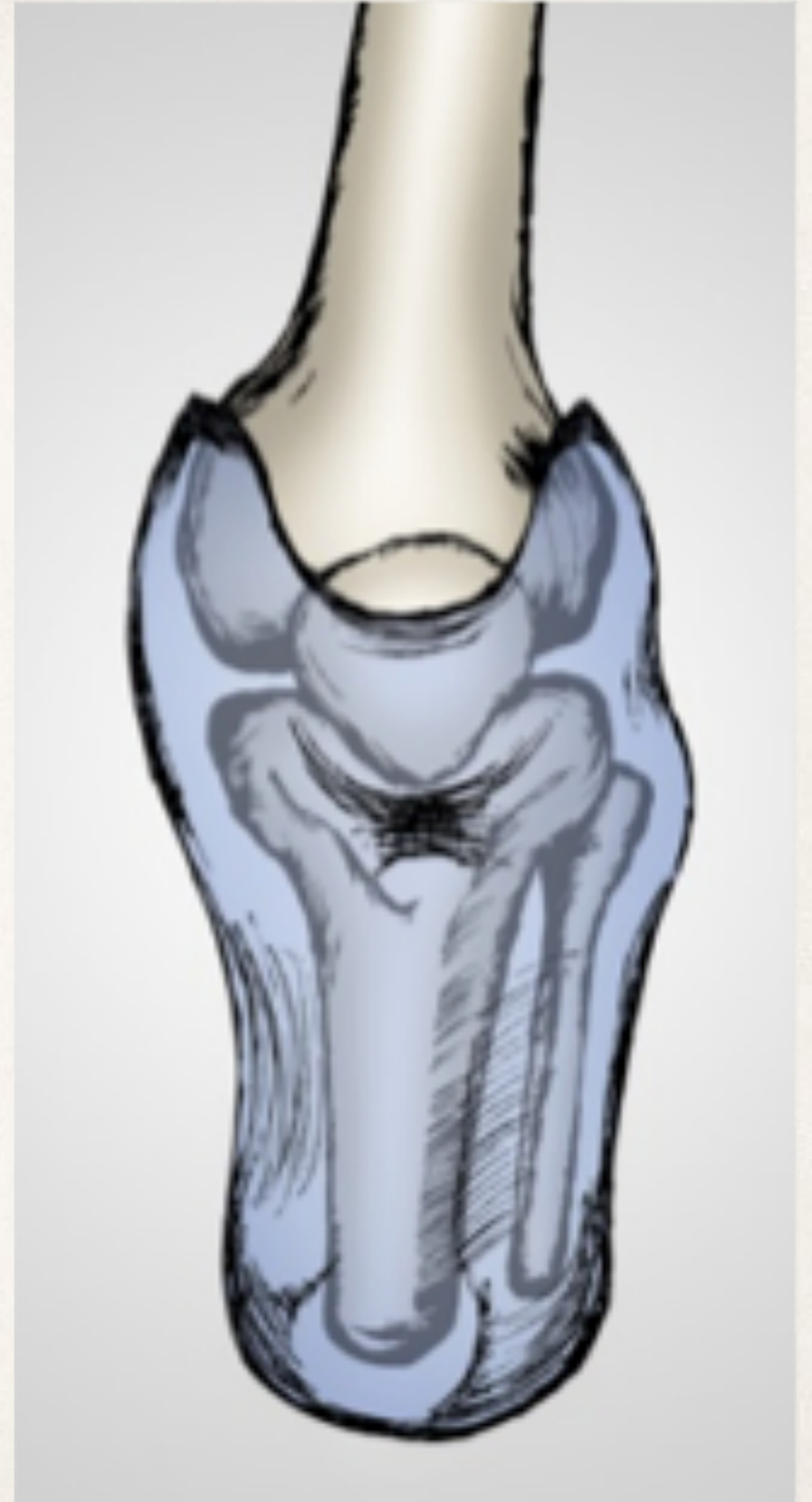
Be seated in this paper, or another sheet, about the center of the body, have the feet pointed directly forward. Right and left side of the body to be marked from the waist down to the feet. Have the feet pointed directly forward, supported by the knees and feet, and around the waist, up to the body, as shown in Cut No. 18. Have the knee of right leg and the knee of left leg. Have the pencil around the right leg, from the waist to the foot, as represented in Cut No. 19. Have the pencil around the left leg, from the waist to the foot, as represented in Cut No. 20. Have the pencil around the right leg, from the waist to the foot, as represented in Cut No. 21. Have the pencil around the left leg, from the waist to the foot, as represented in Cut No. 22. Have the pencil around the right leg, from the waist to the foot, as represented in Cut No. 23. Have the pencil around the left leg, from the waist to the foot, as represented in Cut No. 24.





SEATED
PORTRAIT
PHOTOGRAPHED BY *Boydman* & TAYLOR

Total Contact/ Total Surface Bearing



Exo

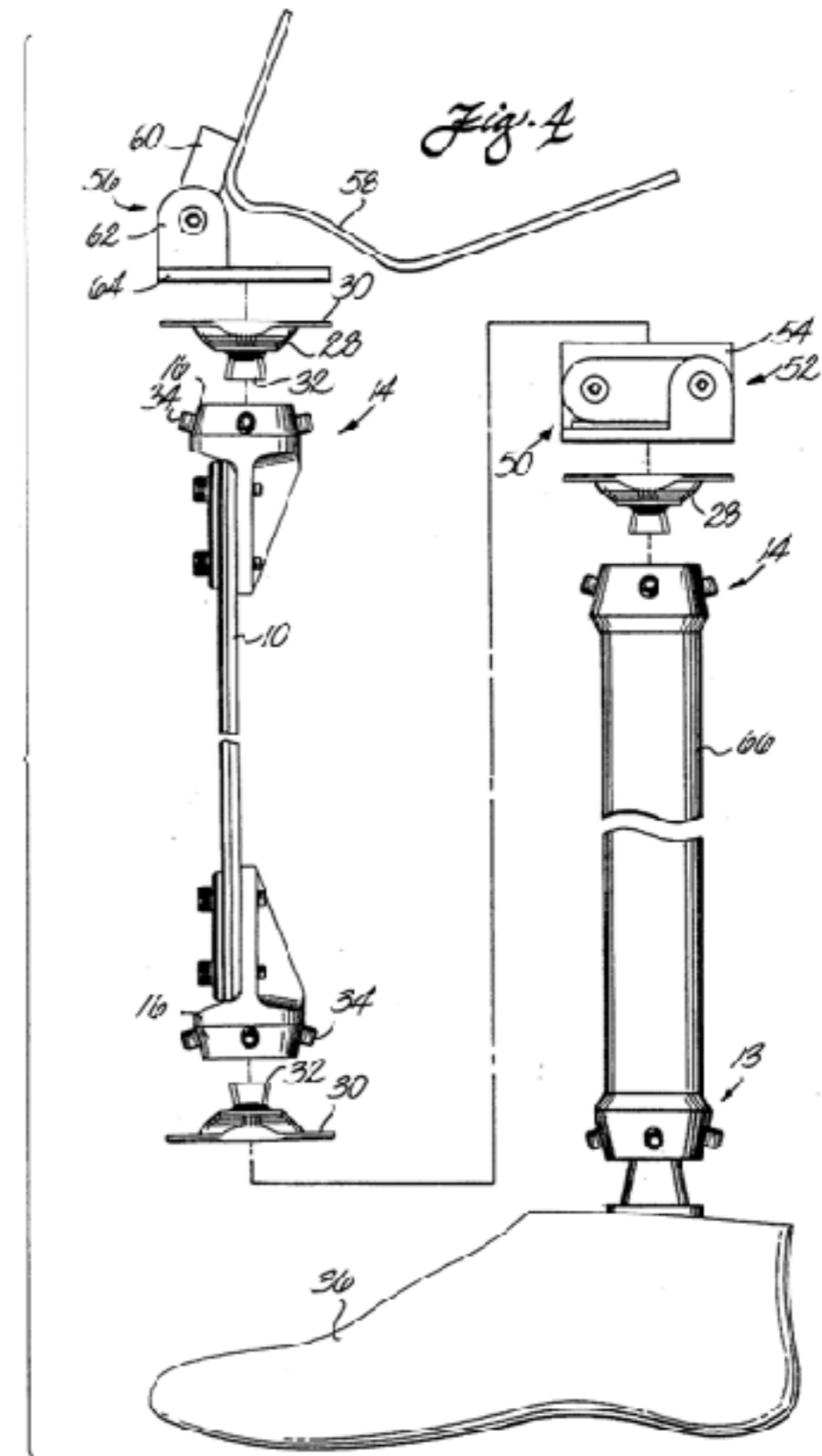
Alignment adjustability





Exoskeleton vs Endo

80's-90's



SECTION THREE

- ❖ What ya can't see on the X-ray is that she is a flaming schizophrenic.



A prosthesis must fit intimately enough to comfortably support the limb during high loading, not bother the soft tissues and bone and transfer motion from the human to the device with extreme efficiency.







Total Contact/ Total Surface Bearing

PREDICTING CHANGE!



www.vendalimb.com

Adult leg: £99.99
Child leg: £59.99

Fitting service available
see
www.vendalimb.com
for details

MSD Vouchers and Credit
Cards Disp

COIN OPERATED
SELECT SIZE OF PROSTHESE
PROSTHESE SELECTION
ENTER AGE
KEYPAD
CARD PAYMENT
CASH PAYMENT

Service -



SECTION FOUR

- ❖ It is hard when the expectation of the patient is greater than the design can provide.







**DIPO
POWER**

CYBATHLON 2016
35
RADO CY
DIPO Power
ETH zürich

sche

Find a problem
that needs to be
solved!



HUMAN?



Prosthetics is about Health Care

- ❖ It is a process -not an event and the “device” is a result of a careful examination/ evaluation and fitting
- ❖ It is a process of virtually continuous change

THE PERFECT
DEVICE IS ONE
THAT
BALANCES ALL
OF THE ABOVE
FOR THAT
INDIVIDUAL





ATLAS

L'EXOSQUELETTE POUR LE SOULAGEMENT ET L'ACCOMPAGNEMENT

Exo Technology solves back pain

\$4500.00

Date



Exo Back Brace

Comfort

Function

Cosmesis

Cost

Cool

+/-



Two pathways to prosthesis provision

- ❖ Vend a prosthesis
- ❖ provide prosthetic care.

Research showed 30 years ago that traction had no real effect on DDD because the discs don't rehydrate and the resulting facet arthritis is probably the cause of the pain. Mechanical back pain responds well to therapy and postural training, not to mention weight loss, and orthoses have minimal effect. (Rogers)

30% of people will feel significantly better just by being given the brace



Date

Why are we hell-bent on making people with amputations better than human when we're not making able-bodied humans better than human?

Lets play a
Game



Adidas' latest 3D-printed running shoe will cost you
\$333

Comfort

Weight

Noise

Pain

Pressure

Snugness / Looseness

Garbage in

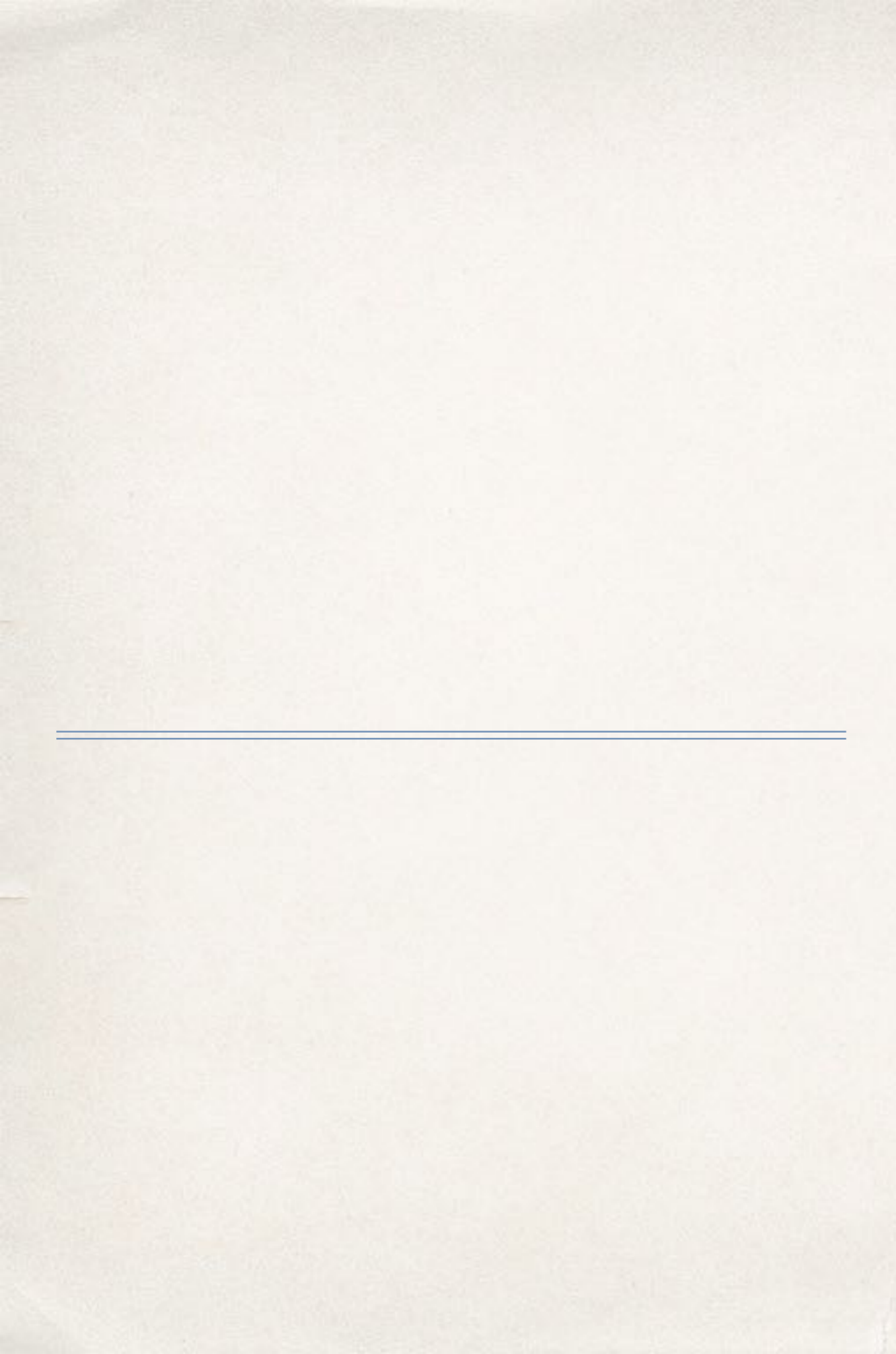
Making a Better Sport Shoe.

- ❖ Garbage in

- ❖ Make a device to get the garbage in (time/ energy)

- ❖ Scan

- ❖ Print



Case studies

Wounds

Interosseal Neuroma

scar tissue

H.O.

pain

How do we make prostheses now

- ❖ Garbage-in

- ❖ Scan

- ❖ Cast

Costs:

- ❖ Cost benefit analysis

Cost

People don't like to wear stuff. that
doesn't help them.

- ❖ Glasses, shoes, sweaters, hats, braces, gloves and
PROSTHESES

	Body Power	Myoelectric
Comfort	✓	
Function	✓	
Cosmesis		✓
Cost	✓	
Cool		✓

WE HAVE A PROBLEM WITH TECHNOLOGY

- We always want something new, often without formal training and **WITHOUT QUANTIFIABLE BENEFIT** and on some occasions, causing harm.

Liner

Thick inner boot for comfort & protection of the foot and ankle. Machine washable

Size Marks

Outer Boot

Made of polyurethane material that won't crack or break.

IPS Support Plate

Improves comfort, stability and increases the rebound effect.

IPS Shells

Spring arcs made of "Space Age" plastic material. (Upper and lower shells are the same)

Non-Slip Tread

Rugged sole for all surfaces, indoors and out.
Assembled with 4 clamps

Easy Buckles

Quick release buckles and sturdy straps allow fast, easy on & off.

Hinge Feature

Allows ankle to move freely.

4 TwinTurbos

Patented Rebound boosters

IPS T-Spring

Adjustable / Interchangeable Tension
Bands to fit your weight or usage.







