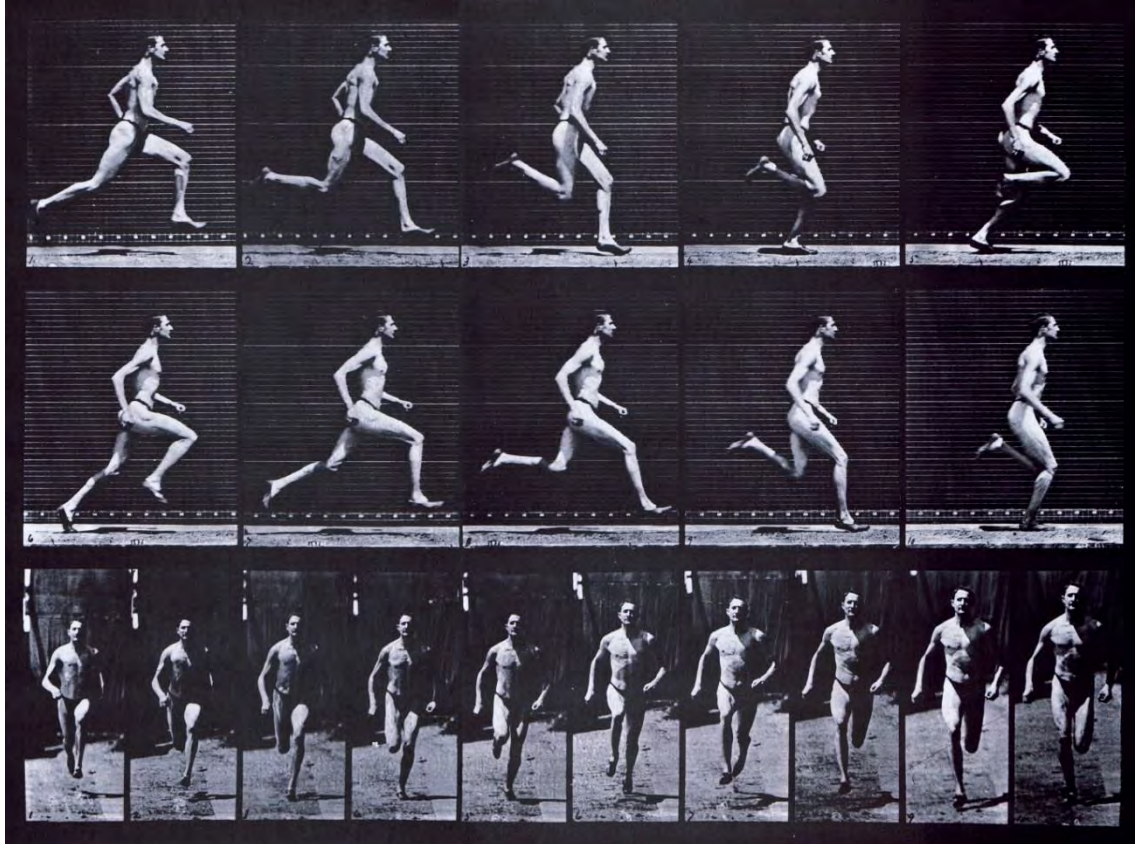


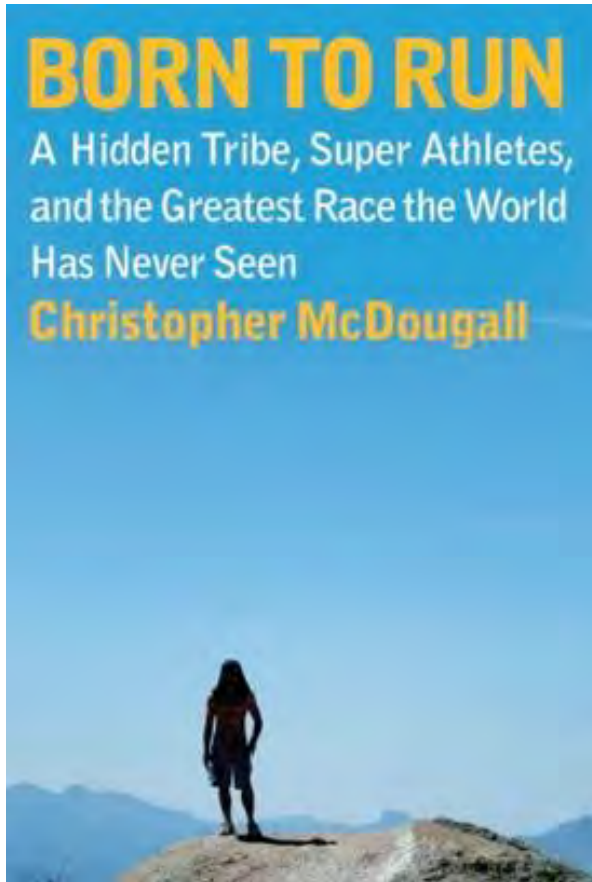
# Performance



- Safety/Injury
  - Balance/Imbalance-Falls
  - Resistance/Susceptibility
    - Forces: Accelerations/Decelerations
    - Joints:
      - Stability/Instability
      - Traction/Impingement
    - Muscles: Strength/Weakness
- Energy Efficiency
  - Stride length/Step cadence
  - Braking
  - Gliding
  - Bounce/Elasticity
  - Resonance
  - Muscle work
- Performance
- Dynamic/Static Foot
- Posture
- Adaptation

How we used to run! (FFS)

# Born to Run



# 20<sup>th</sup> Century



**Belief: Advances in science and technology will solve all of our medical problems including those caused by musculoskeletal diseases.**

# NIKE

June '73  
**NIKE CORTEZ** - *a dream becomes reality*



*NEW Features for the 70's:*  
"Anti-wear plug" at heel for miles of extra wear.  
Choice of 3 styles of uppers for optimal comfort and styling: buffed leather, nylon or suede.  
4-way stretch inner-soles for added comfort and blister protection.  
Extra-wide toe available for the runner with problem feet.

**THE CORTEZ STORY:**  
Originally designed in the mid-sixties by Bill Bowerman, the 1972 U.S. Olympic Coach, the "Cortez" was conceived as the supreme training shoe for the long distance runner. The Cortez combined a thick long-wearing outer sole with a full-length sponge mid-sole cushion to absorb road shock and reduce leg fatigue, simultaneously elevating the heel to reduce Achilles tendon strain. The Cortez was a new concept in distance training shoes. With the experience of the 60's as a base, Bill Bowerman and NIKE have evolved the Cortez into a line to meet the varying needs of all runners.

**Available from:**  
**The Athletic Dept.**  
1207 Jericho Turnpike  
New Hyde Park, L.I.  
New York 11040  
(516) 488-1877

4733 S.E. Hawthorne Blvd. Portland, Oregon 97215 (503) 234-0342	363 Bloomfield Avenue Montclair, New Jersey 07042 (201) 744-6400	1246 East 4th St. Long Beach, Ca. 90802 (213) 432-3536
855 Olive Street Eugene, Oregon 97401 (503) 343-5010	26 Summer Street Natick, Massachusetts 01760 (617) 655-6078	13101 "A" Harbor Blvd. Garden Grove, Ca. 92704 (714) 636-3291
2114 Addison Street Berkeley, California 94704 (415) 843-7767	10113 Washington Blvd. Culver City, California 90230 (213) 839-4848	3522 North Rosemead Blvd. Rosemead, Ca. 91170 (213) 973-9880

- 1973
- Bill Ballenger/Phil Knight
- "Modern" athletic shoe (MAS)
- Comfortable
- Adopted quickly
- Amazing sales
- Became standard clothing like underwear

# Running Performance

## 1980s

- Before and after 1973
- US Elite runner performance
  - Declined in long distance events
- Fastest Runners
  - Ethiopians, Kenyans, Nigerians

## 1990s

- Elite runners looked for solution to performance decline
- Barefoot running?
- Elite US runners started to train running barefoot

## **Barefoot Running “Craze”**

- **Change in running technique**
- **Development of Minimalist shoes**

# Research

## Shod Running

- Inverted Pendulum
- Braking - initial contact in front of COM
- Heel strike
- Long-stride length
- Reduced step frequency

## Unshod – Barefoot Running

- Mass-spring
- No Braking - initial contact under COM
- Shorter stride length
- Higher step frequency
- Cadence (160-180 steps/min)



# Run Fast!



- Shorter stride-length
- Higher step cadence
- FFS
- Ground contact under COM