

Force Curves

Understanding Force Curves to Improve

Neil Bergenroth

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[My Last High School Race Story](#)

THANK YOU, COACH

[Thank you coach!](#)
[Coach Appreciation Week](#)
[Blog Post](#)



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Why Did I Decide To
Wear a Boston Celtics
Hat For The Eastern
Sprints?



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USRowing Level III Coach

Power Ten Development, LLC - Mobile App and Web
Programmer

Credit - “I Stand On The Shoulders Of Giants”

Sincere thanks and gratitude to Peter Mallory (Rowing Historian and The Sport Of Rowing Author) for supplying the force curve graphics and the various images for this presentation in addition to investing time discussing his research on force curves and biomechanics/technique. This presentation would not have been possible without his considerable help.

Thanks to the late Cas Rekers and Rowperfect for his work capturing the force curves presented here.

Where Are You Located?



When poll is active, respond at **PollEv.com/neilbergenro764**

Text **NEILBERGENRO764** to **37607** once to join

How Much Do You Do You Know About Force Curves?

What's a Force Curve?

Somewhat...

Quite a bit, enough to
be dangerous

I am Yoda when it
comes to Force Cruves

None of the above

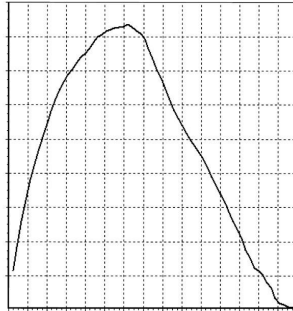


Where Do You Put Emphasis In Your Drive Phase?

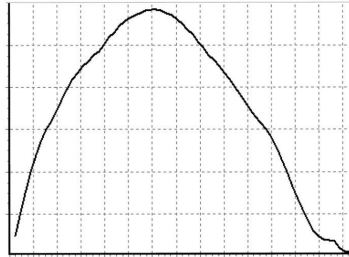


A Word Of Warning

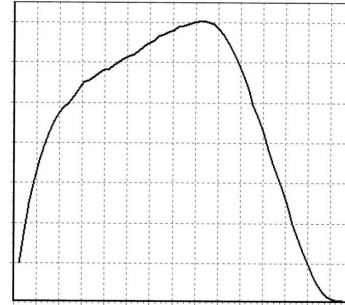
Comparison Of Force Curves



Drysdale



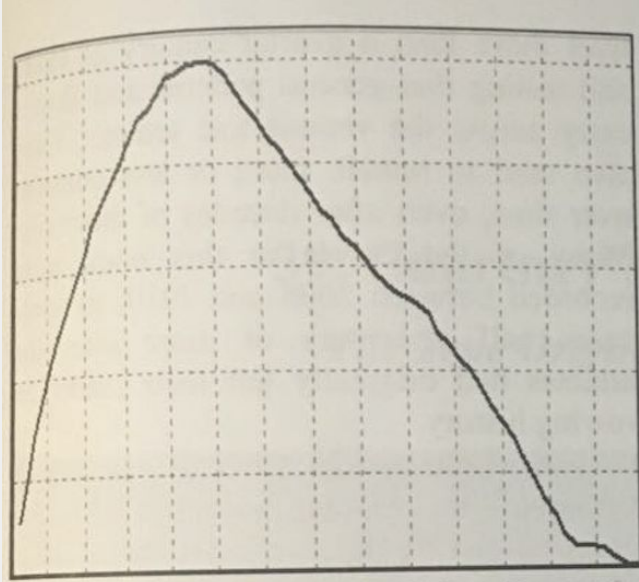
Lange



Haining

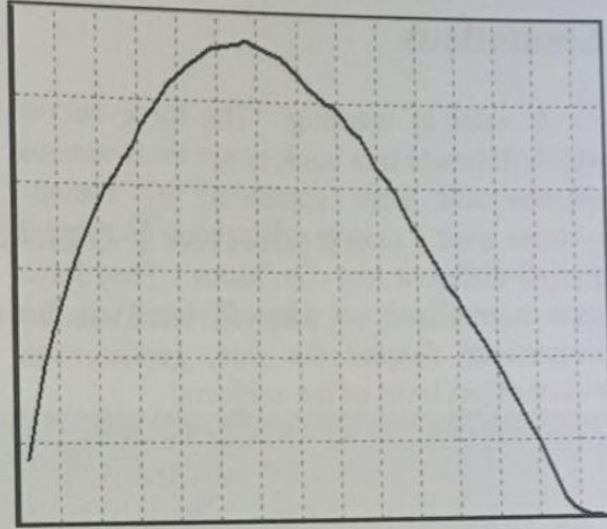
Note: Comparison Is **Shape** not Magnitude

Historical Context



Cas Rekers, Rowperfect

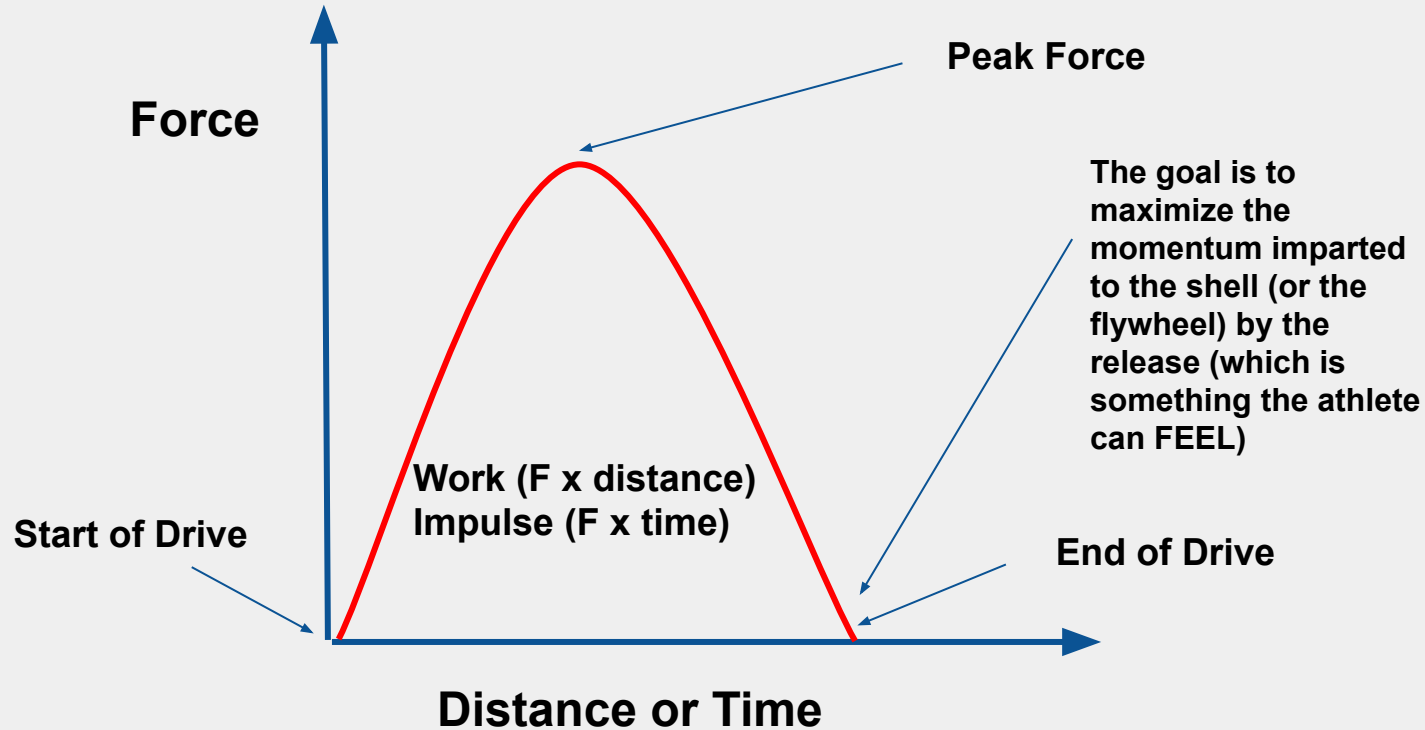
Marjolein Rekers, 1995
Cas Rekers' daughter before training
with the Rowperfect interface.



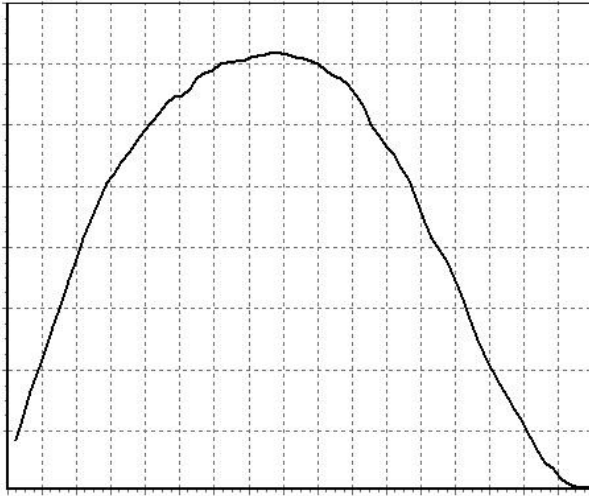
Cas Rekers, Rowperfect

Marjolein Rekers, 2003
Cas Rekers' daughter after training
with the Rowperfect interface.

What Is A Force Curve?



Can We All Agree? What Are We Aiming For?



Pure and Simple
BOAT SPEED!

The force curve is a window into the effort of force application during the drive phase.

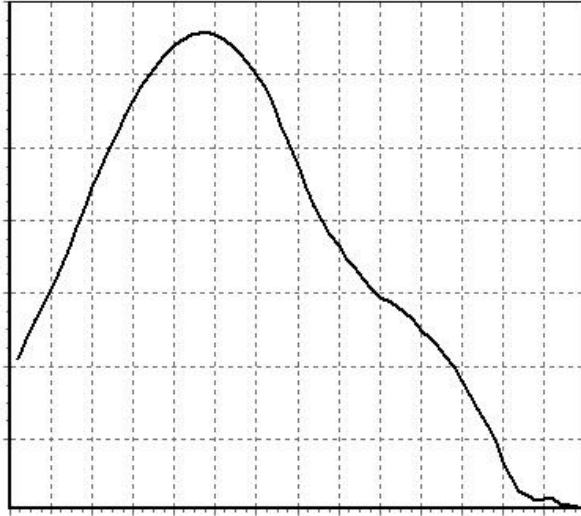
Kernschlag

vs

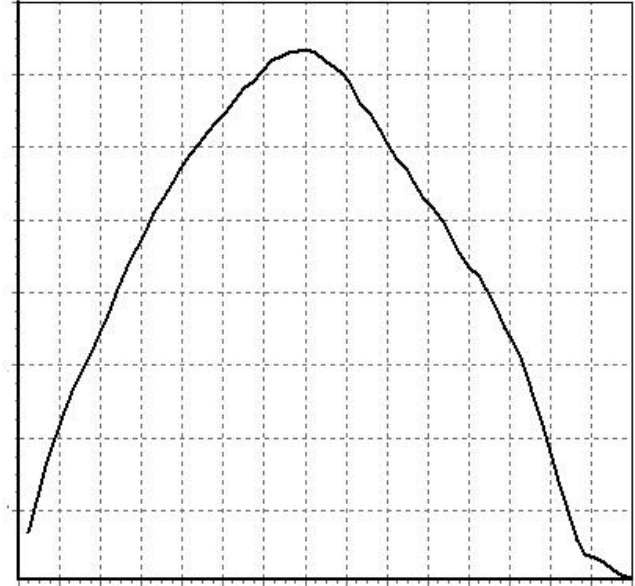
Schubschlag

“Solid Stroke With Hard Beginning”

“Thrust Stroke”



Immediate Explosive Leg Drive,
Front loaded force application

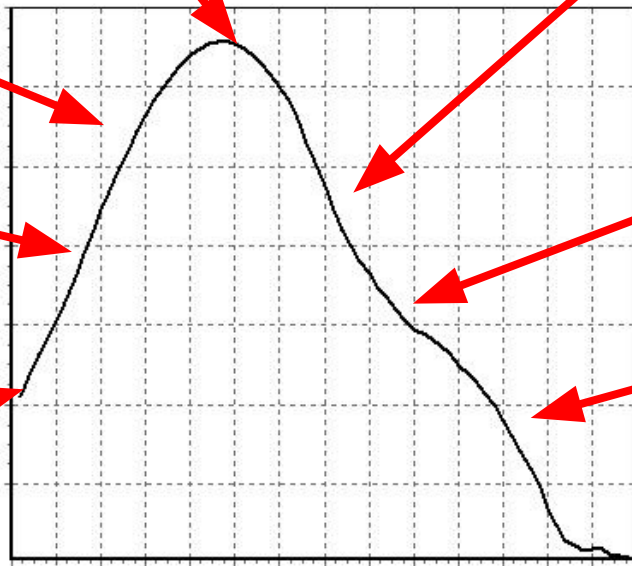
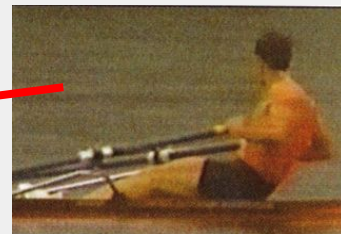
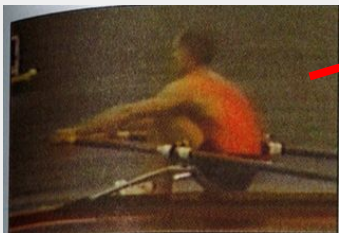
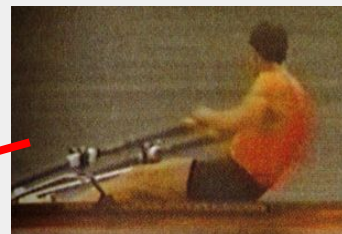
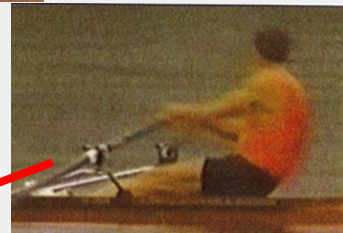
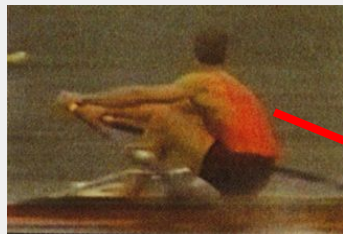
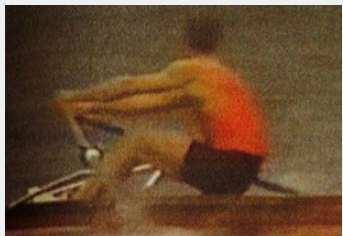


Progressive application of force
from the entry, surging force
application from entry to release

Frans Gobel

Mens Lwt 1x
1989-90 (World
Champion)

Kernschlag



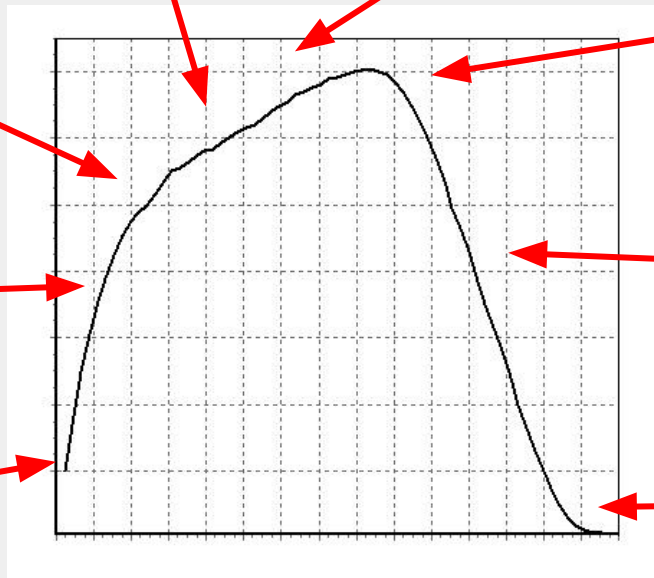
Photos and Graphics Courtesy Peter Mallory/Cas Rekers:
The Sport Of Rowing/Rowperfect

Peter Haining

Mens Lwt 1x
1993, 1994, 1995
(World Champion)

1993 World Championships
Race Highlight:

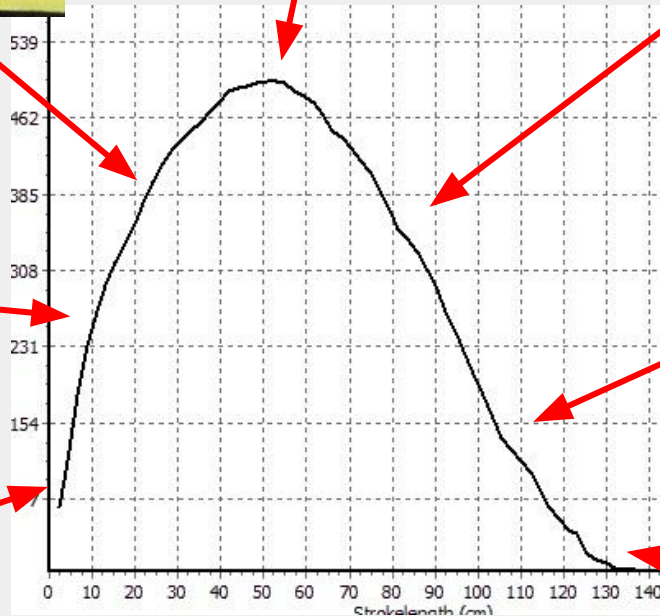
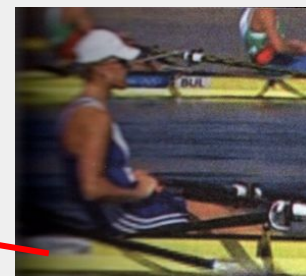
<https://youtu.be/Of3YwwfNoUI?t=382>



Photos and Graphics Courtesy Peter Mallory/Cas Rekers:
The Sport Of Rowing/Rowperfect

Sarah Winckless

2004 Olympic
Bronze Medal



Photos and Graphics Courtesy Peter Mallory/
Cas Rekers: The Sport Of Rowing/Rowperfect

<https://youtu.be/yI303hsu3UM?t=112>

Thomas Lange

Mens 1x

1987, 1989, 1991

World Champion

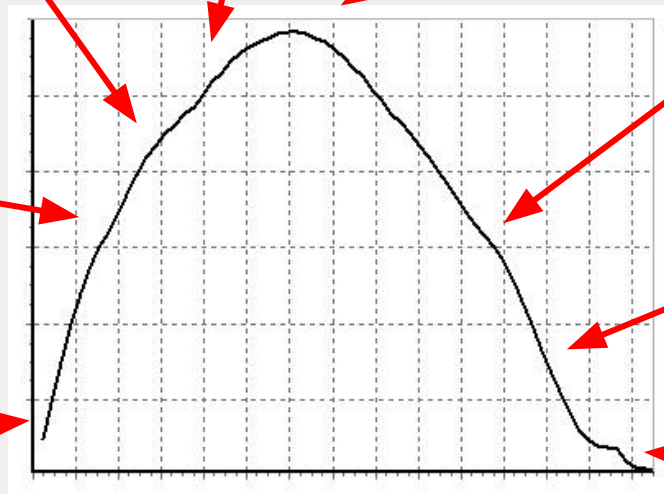
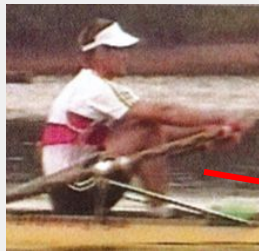
1988, 1992

Olympic Champion

1992 Olympics

Race Highlight:

<https://youtu.be/crYedwKMTeo?t=231>



Photos and Graphics Courtesy Peter Mallory/Cas Rekers:
The Sport Of Rowing/Rowperfect

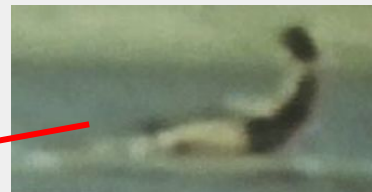
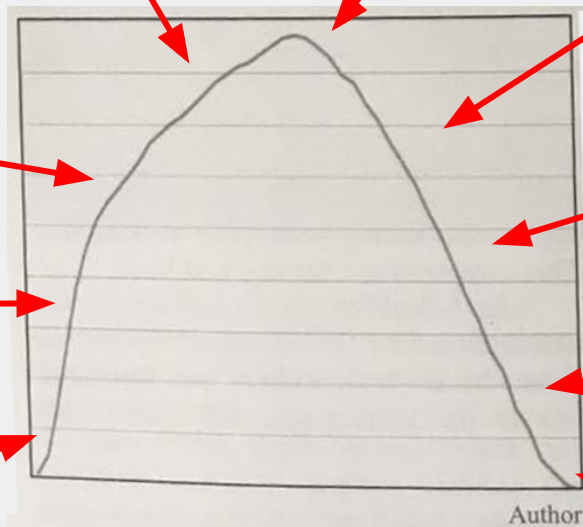
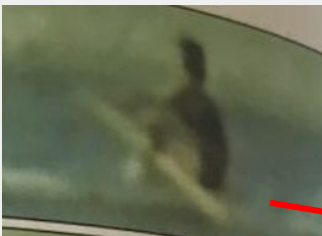
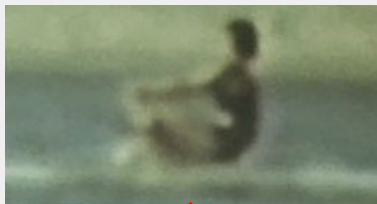
Joan Lind-Van Blom

1x 1976

Olympic Silver
Medallist

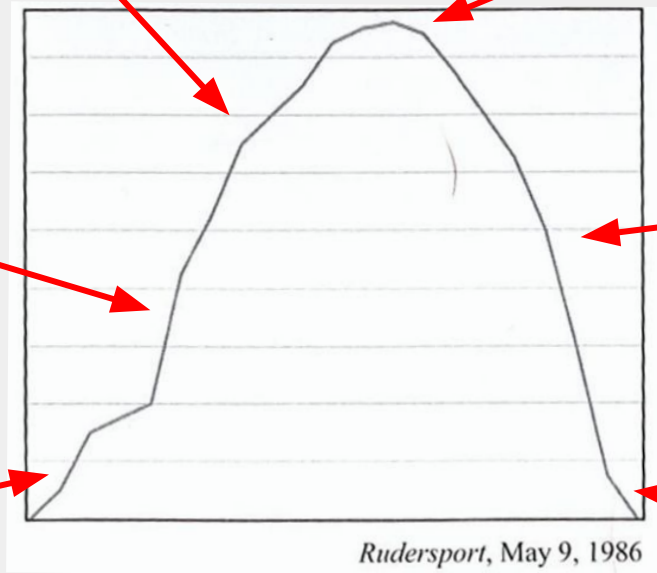
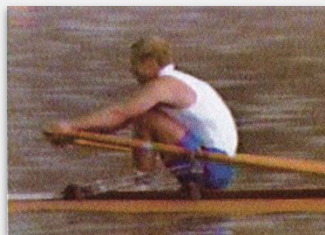
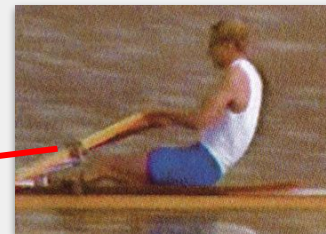
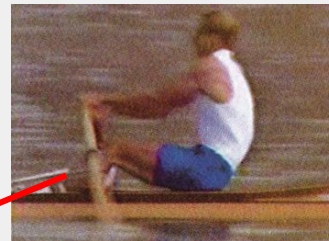
4x+ 1984

Olympic Silver
Medallist



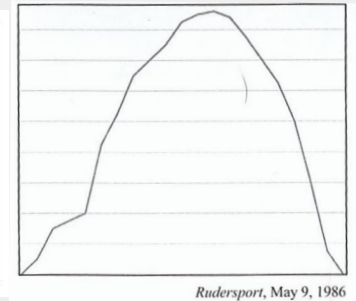
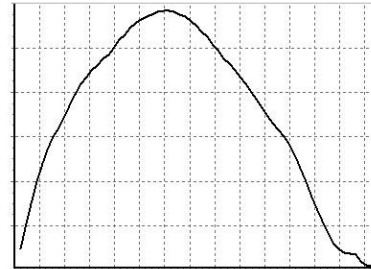
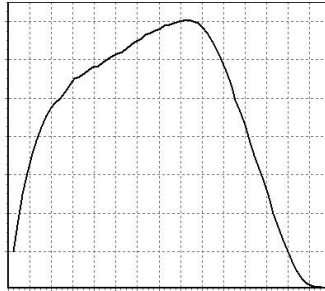
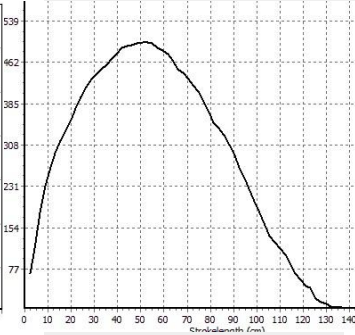
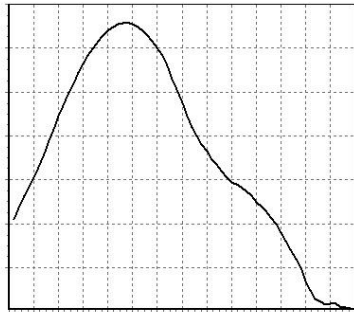
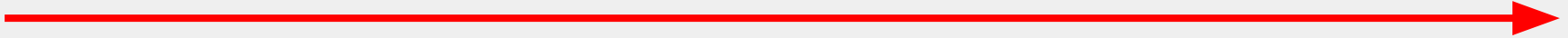
Pertti Karppinen

Mens 1x
Olympic Champion
1976, 1980 and 1984



Photos and Graphics Courtesy Peter Mallory/Cas Rekers:
The Sport Of Rowing/Rowperfect

Force Application Continuum



Rudersport, May 9, 1986

Kernschlag

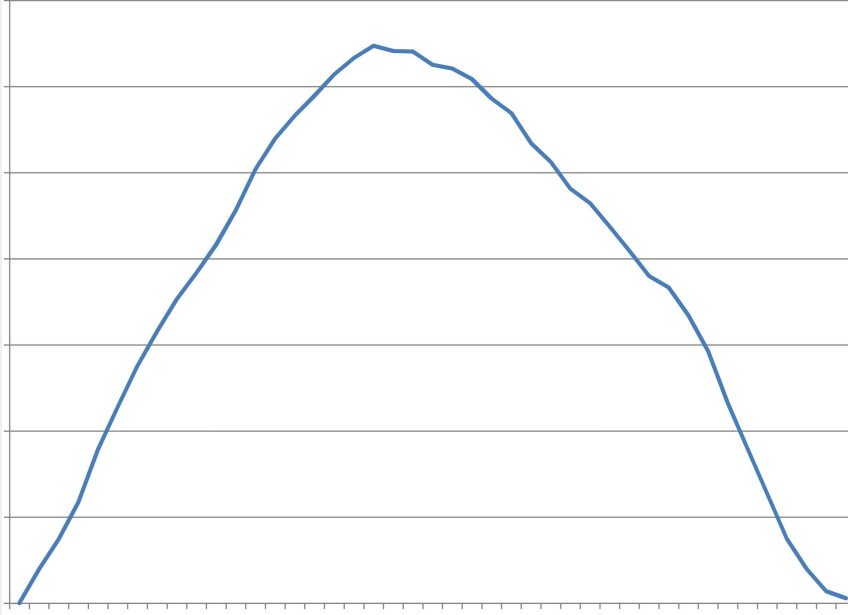
***Kernschlag* curves are in the vast minority of successful crews, far less than 10% at the international level.**

Schubschlag

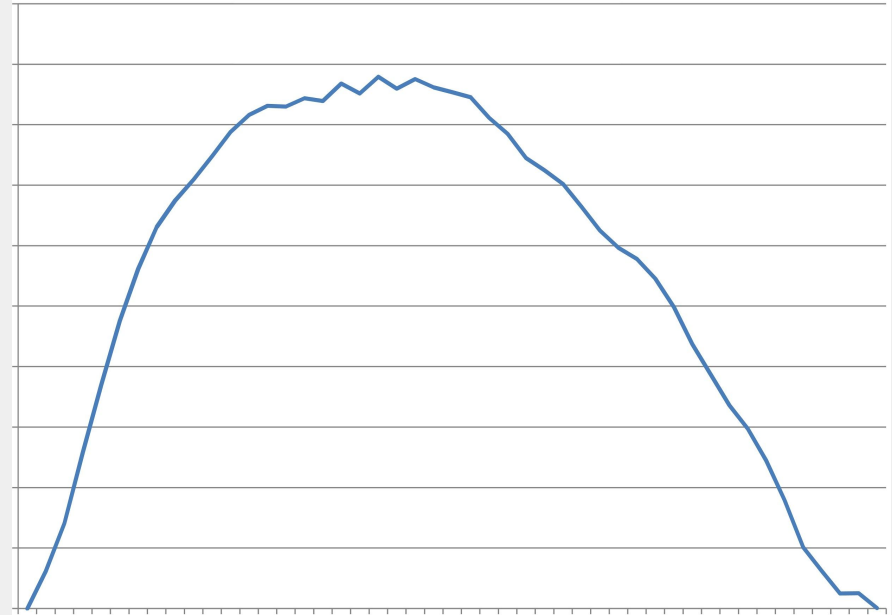
Photos and Graphics Courtesy Peter Mallory/Cas Rekers:
The Sport Of Rowing/Rowperfect

LA Olympics 1984 - Assault On Lake Casitas

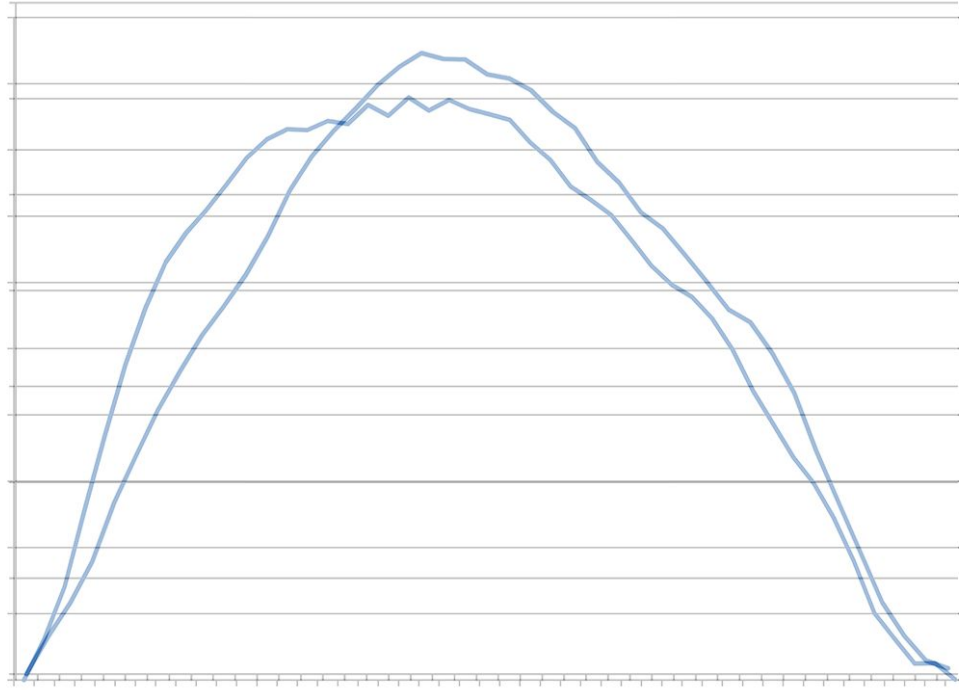
Brad Lewis



Paul Enquist



Lewis and Enquist Superimposed



Photos and Graphics Courtesy Peter Mallory/Cas Rekers:
The Sport Of Rowing/Rowperfect

So How Do I Row An Effective Force Curve?

Our First Clue...



<https://youtu.be/Ptpb51UquOo?t=46>



<https://youtu.be/WxQN2mjNc7Y>

Harry Mahon - Where Is The Crew Focussing?

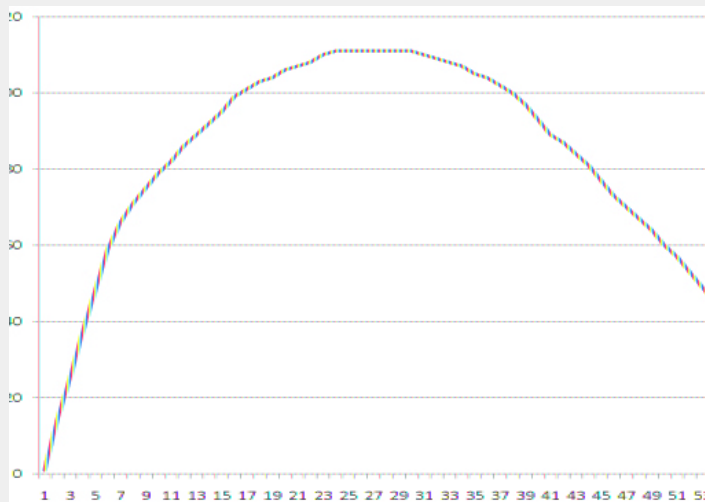


Time: 9:41 -
discussion of
where they are
focussed.

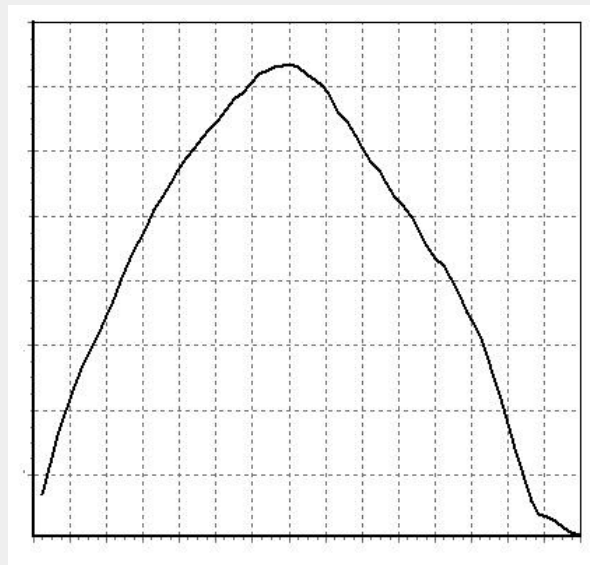
<https://youtu.be/7tNixY3GIQA?t=584>

Harry Mahon Coached Athletes

“Energy expended at the catch is not available for the end of the stroke”



CAS REKERS



GREG SEARLE

Photos and Graphics Courtesy Peter Mallory/Cas Rekera:
The Sport Of Rowing/Rowperfect

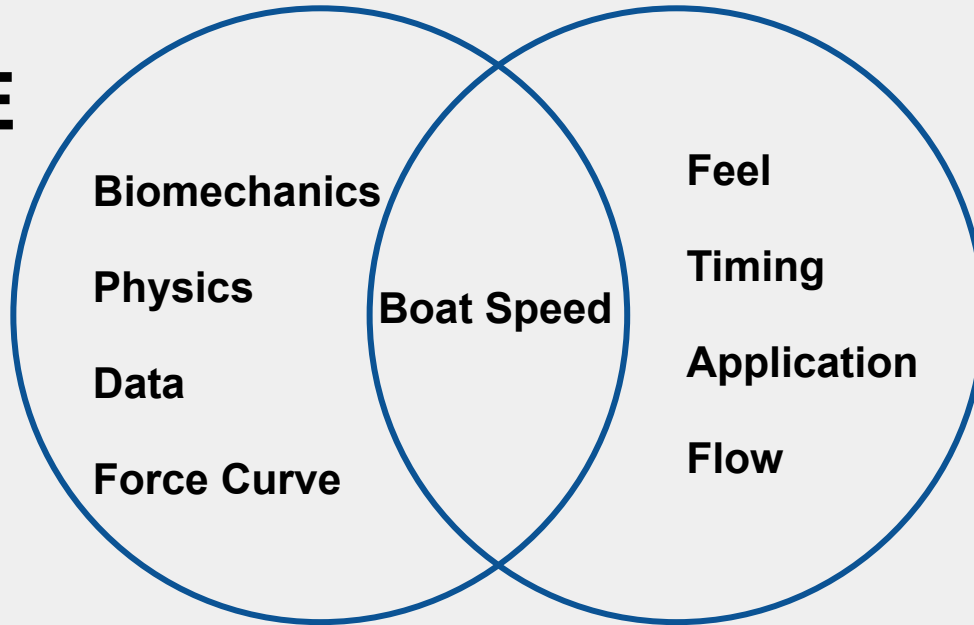


*“It’s About The
Tree Not The
Leaves”*

- Angelo Savarino

Science and Art of Rowing

SCIENCE



ART

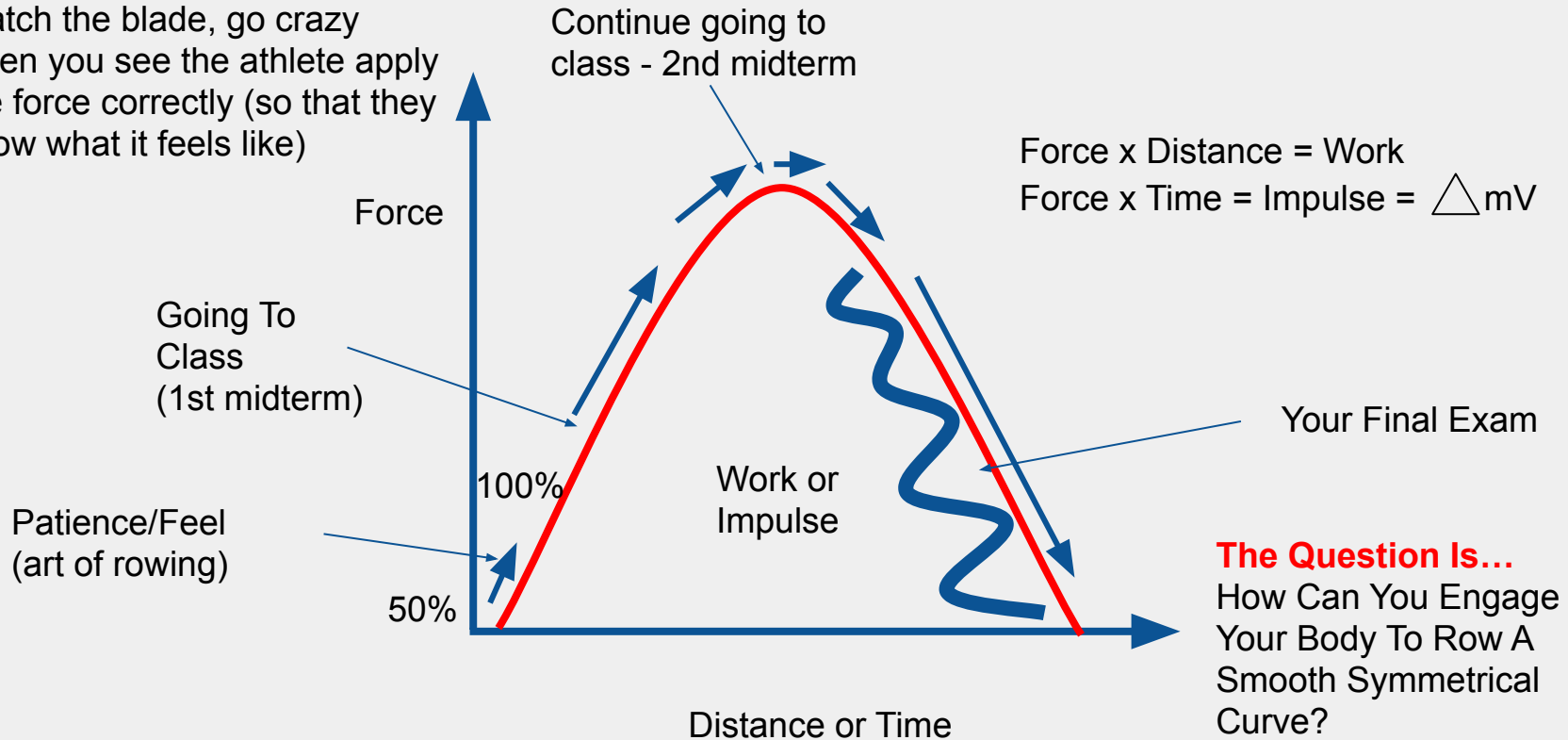


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Conceptualize/Feel The Organic Whole

Words Are Limiting!

Watch the blade, go crazy
when you see the athlete apply
the force correctly (so that they
know what it feels like)



Yale vs Washington (Henley 2015) (Patience and Send!)



(Could also be titled:
**Why Do Steve
Gladstone's Crews
Keep Winning?)**

<https://youtu.be/vxV5xxawyeE?t=128>

Other Examples Of Schubschlag Force Application

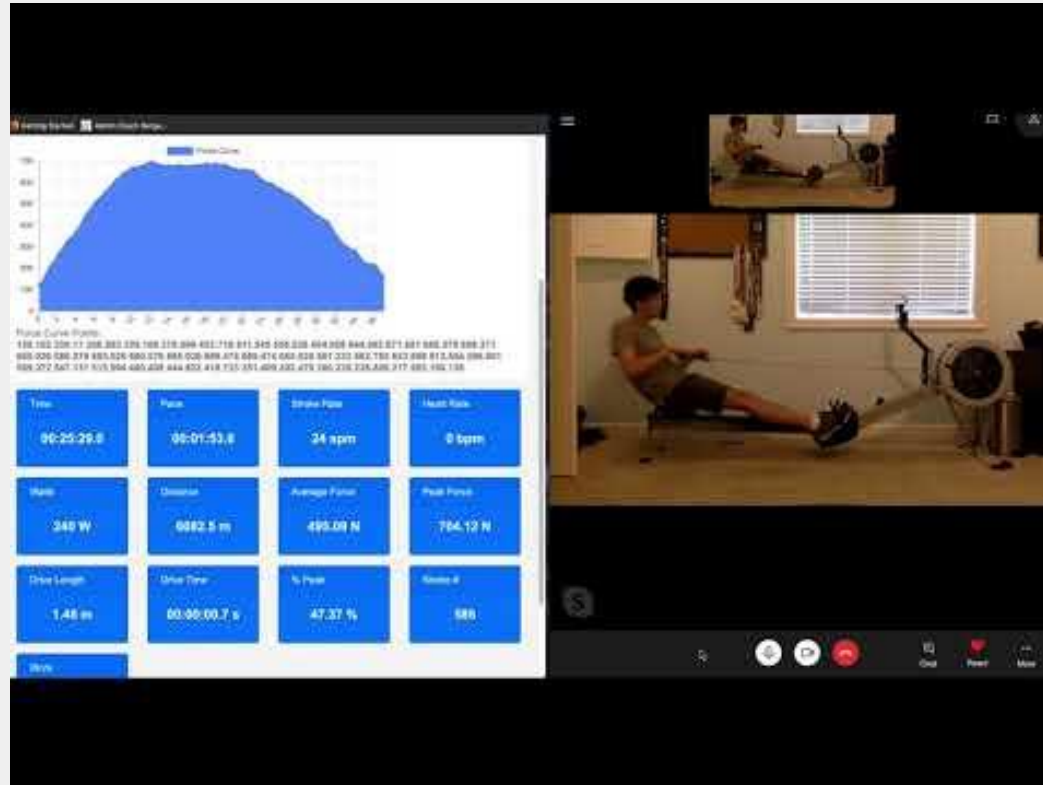


← Watch Damir Martin

Remote Real Time Feedback - Remote Rowing Coach



Remote Real Time Feedback - Remote Rowing Coach



<https://youtu.be/fo80rwQ2D-U>

gROW Tulsa Outreach RowingSTEM



<https://youtu.be/pHuaYGjmP3g>

Applications: Rowing STEM

RowingSTEM
Curriculum Included
With The App



Download on the
App Store



GET IT ON
Google Play

<https://youtu.be/fgechTzDRWA>

Curriculum:

https://drive.google.com/drive/folders/1_2toYy82TI-tKohTR7QpWAgRi3trfBee?usp=sharing

When poll is active, respond at **PollEv.com/neilbergenro764**

Text **NEILBERGENRO764** to **37607** once to join

How Much Do You Know About Force Curves?

A

B

C

D

None of the above



Homework Assignment

What works for you?

Go experiment and have fun!

A Concept2 PM monitor force curve is enough!

RP3

Biorower

Questions?

