

**30th LEN EUROPEAN CHAMPIONSHIPS  
BUDAPEST (HUN) 2010**



*August 13.2010  
LEN Coaches' Clinic*



# Block Periodization: Scientific Concept and Implementation

*Vladimir B. Issurin,*  
*Ph.D., Professor*  
**Israel**



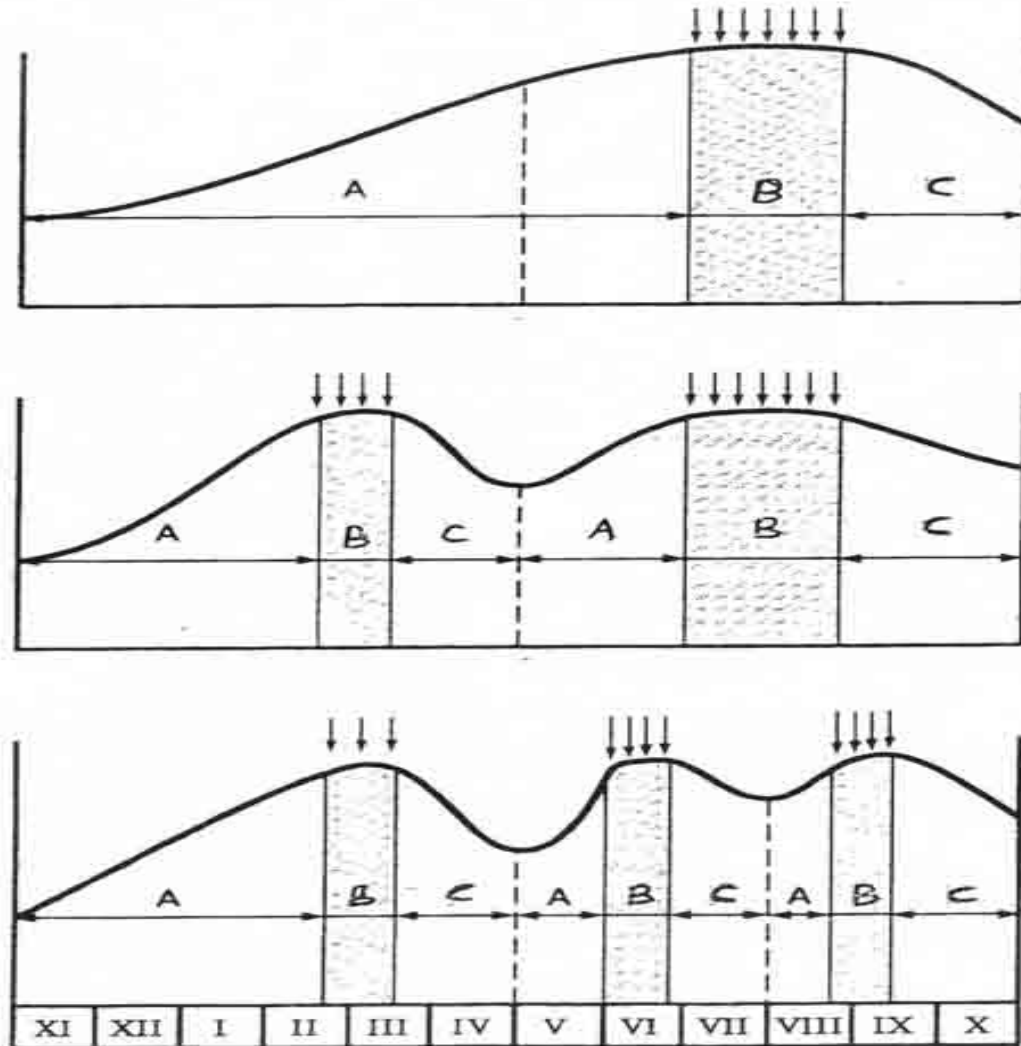
# Plan

- **Traditional theory – criticism and restrictions**
- **Alternative approach: basics and outcomes**
- **Biological background and conclusions**



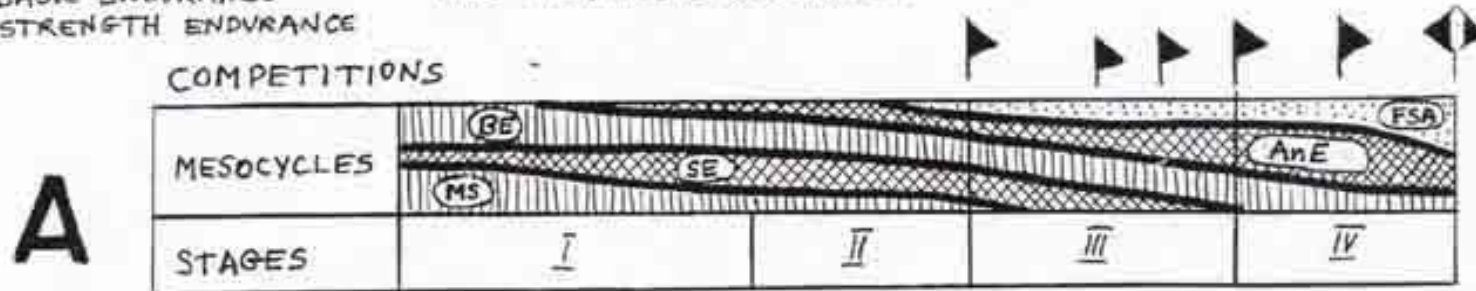
# Traditional theory – scope and criticism

## Classic version of annual periodization (Matveyev, 1964 et al.)



MS- MAXIMAL STRENGTH  
 BE- BASIC ENDURANCE  
 SE- STRENGTH ENDURANCE

FSA- FAST-STRENGTH ABILITIES  
 AnE- ANAEROBIC ENDURANCE



MONTHS	IX	X	XI	XII	I	II	III	IV	V	VI	VII	VIII
PERIODS	PREFARATIONAL						COMPETITIVE					

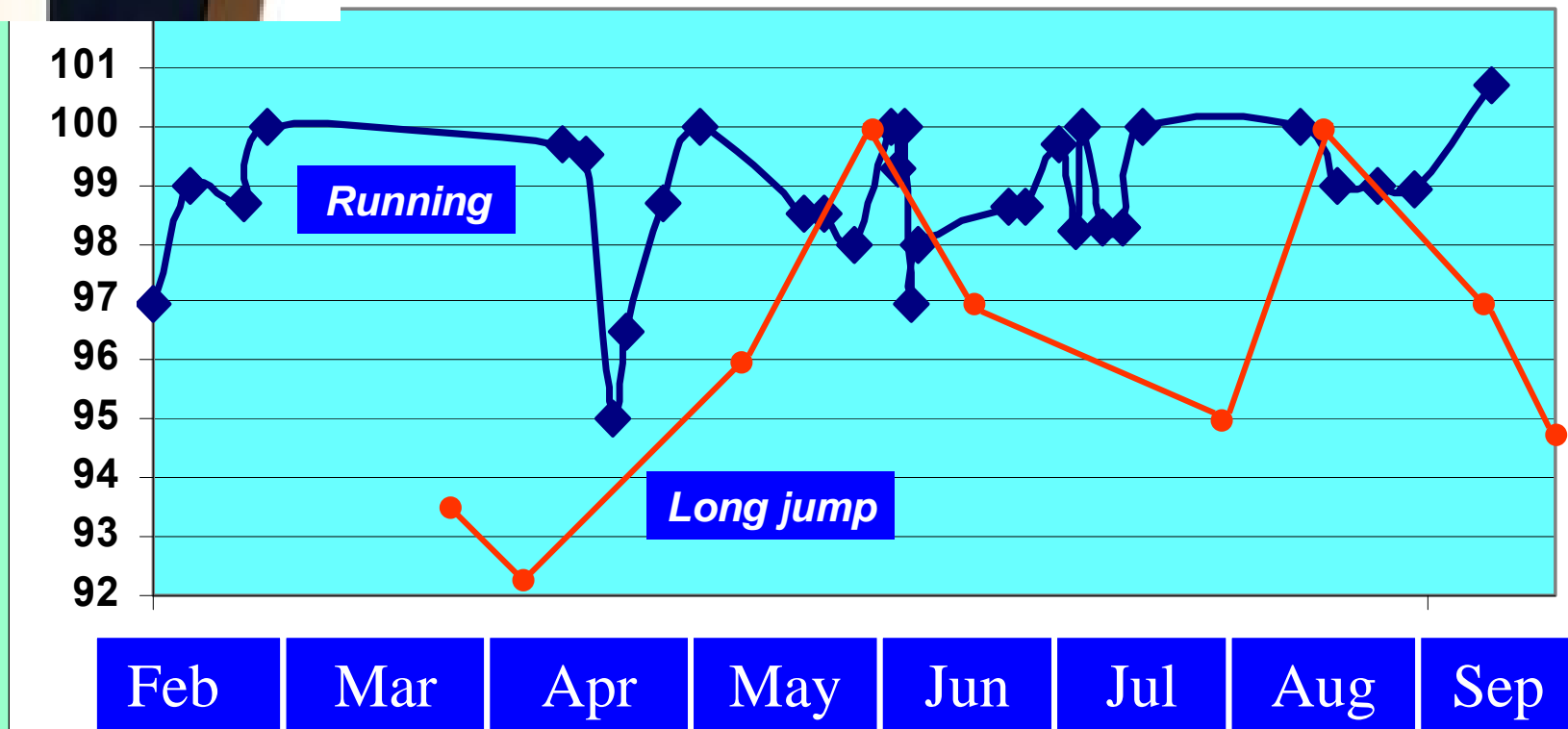
**A** - TRADITIONAL APPROACH **B** - NON-TRADITIONAL APPROACH

ALTERNATIVE SCHEMES OF ANNUAL CYCLE TRAINING

# **Annual performance trends of great athletes**



# Marion Jones: Performance trend in season 1998

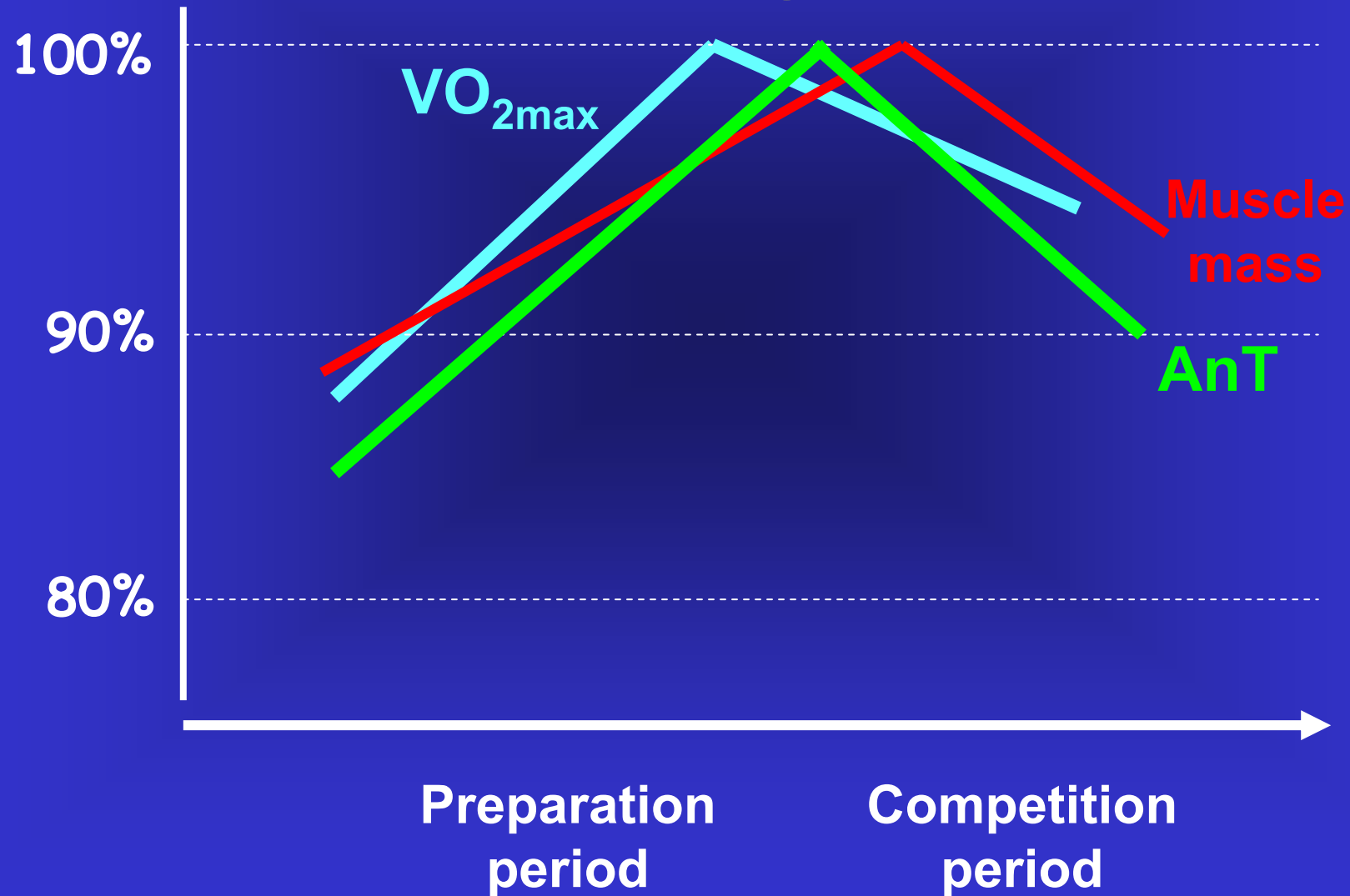


Source: Suslov, 2003





# Traditional Model – Typical Changes



## **Multi-targeted “mixed” training – sad outcomes:**

**Excessive workloads,  
Accumulated fatigue,  
High stress indices,  
Conflicting physiological responses,  
High risk of overtraining**

**“Mixed training produces mixed results”  
*Stegeman, 1981***

# Question

- **Should many abilities be trained at the same time?**

# Facts:

- Simultaneous development of many abilities decreases effectiveness of training
- Body cannot simultaneously adapt to many training stimuli



# Past and Present in High-Performance Swimming



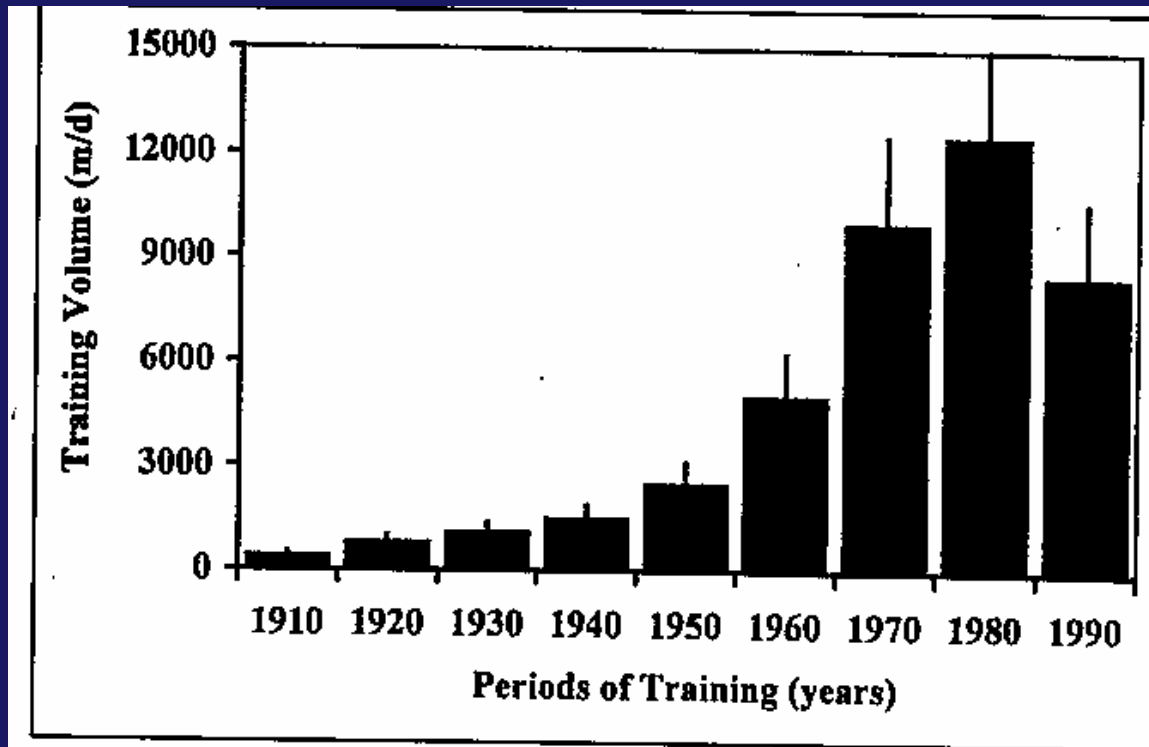


Figure 1. Estimate of training distance based on competitive swimming textbooks for 1900 – 1990. Vertical bars represent the range of training distances reported during those periods.

*Costill, 1999*

# **Annual volumes of exercises in endurance sports (thousands km)**

	<b>1980-90</b>	<b>1995-2009</b>
<b>Swimming</b>	<b>2.5-3.5</b>	<b>2.0-2.5</b>
<b>Kayaking</b>	<b>5.5-6.3</b>	<b>4.5-5.3</b>
<b>Rowing</b>	<b>6.3-7.3</b>	<b>5.5-6.5</b>
<b>Cycling-R</b>	<b>35-45</b>	<b>30-35</b>



# **Annual amounts of performances in world-leading swimmers**

**1965-80**

**1980-90**

**1995-2009**

**30-50**

**50-70**

**70-100**

# Past and Present in High-Performance Training

	Past	Present
<b>Competitions</b>	less	more
<b>Total workloads</b>	more	less
<b>Pharmacology</b>	liberal	hard limitation
<b>Development</b>	mainly	mainly
	simultaneous	consecutive

# **Basic limitations of traditional model**

**Low stimulation producing by  
“mixed” training**

**Conflicting physiological  
responses**

**Excessive fatigue accumulation**

**Inability to take part in many  
competitions**



**Alternative approach:  
blocks and stages**

# Terminology

**Block** – training cycle of highly concentrated specialized workloads

**Earliest attempts to  
implement  
Block Periodized Training**



# **Anatoli Bondarchuk, track and field, hammer throwing**

**Block Periodized system that includes:  
developmental mesocycle,  
competitive mesocycle,  
restoration mesocycle;  
duration of training stage – 9-10 weeks**

**Preparation outcomes - gold-, silver-,  
and bronze-medals attained at the  
1988 and 1992 Olympic Games**

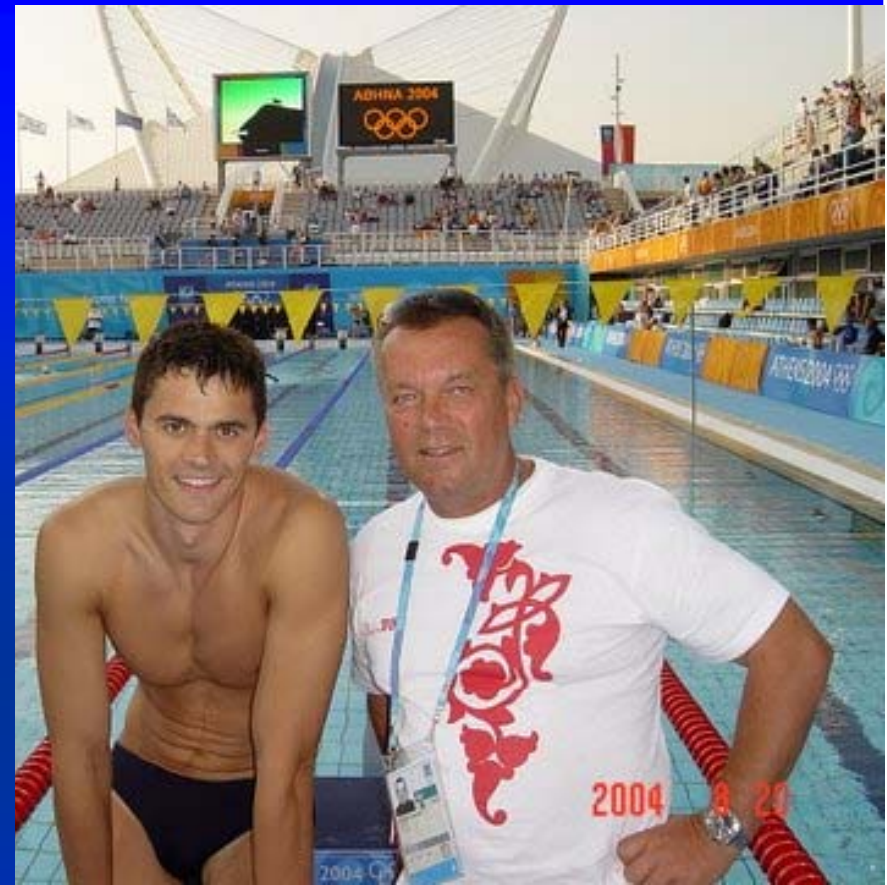
**Publication: *Bondarchuk, 1986,1988***

# Gennadi Touretski, swimming

**Block Periodized system that includes: general, specific, and competitive mesocycles; duration of training stage – 6-10 weeks**

**Preparation outcomes – numerous gold medals of Alexander Popov and Michael Klim attained at the Olympic Games and World Championships**

**Publication: *Touretski, 1993, 1998***



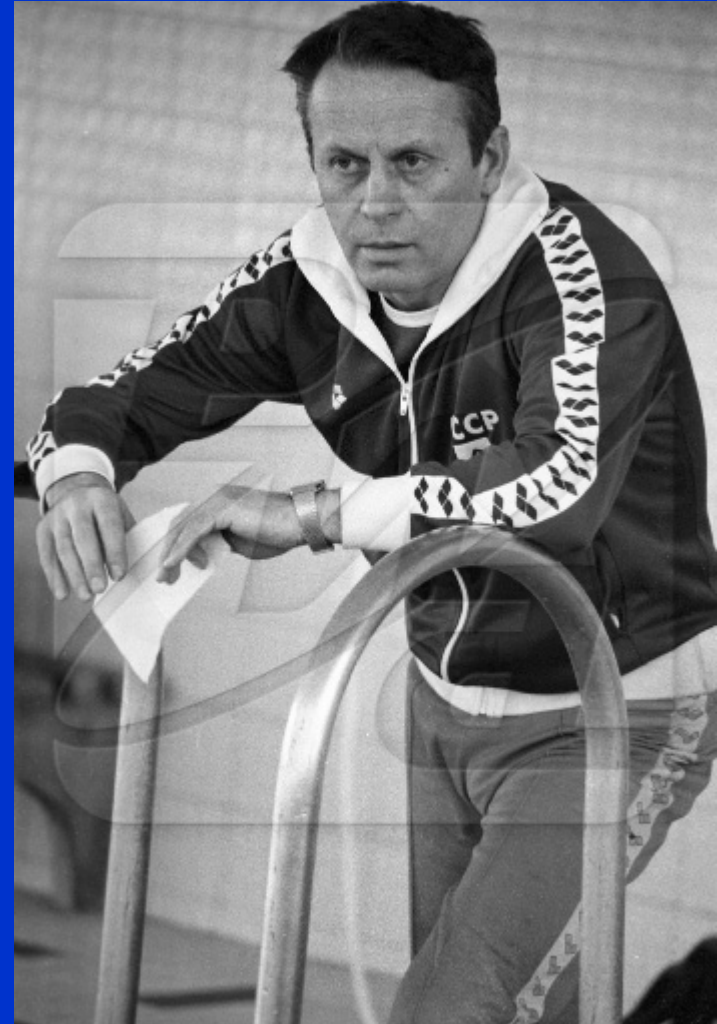


# Igor Koshkin

## Swimming

**Block Periodized system that includes:  
speed/technique, strength, aerobic  
conditioning, taper and competition,  
restoration;  
duration of training stage –10 weeks**

**Preparation outcomes – three gold  
medals of Vladimir Salnikov;  
numerous medals attained by other  
swimmers in European and World  
Championships**



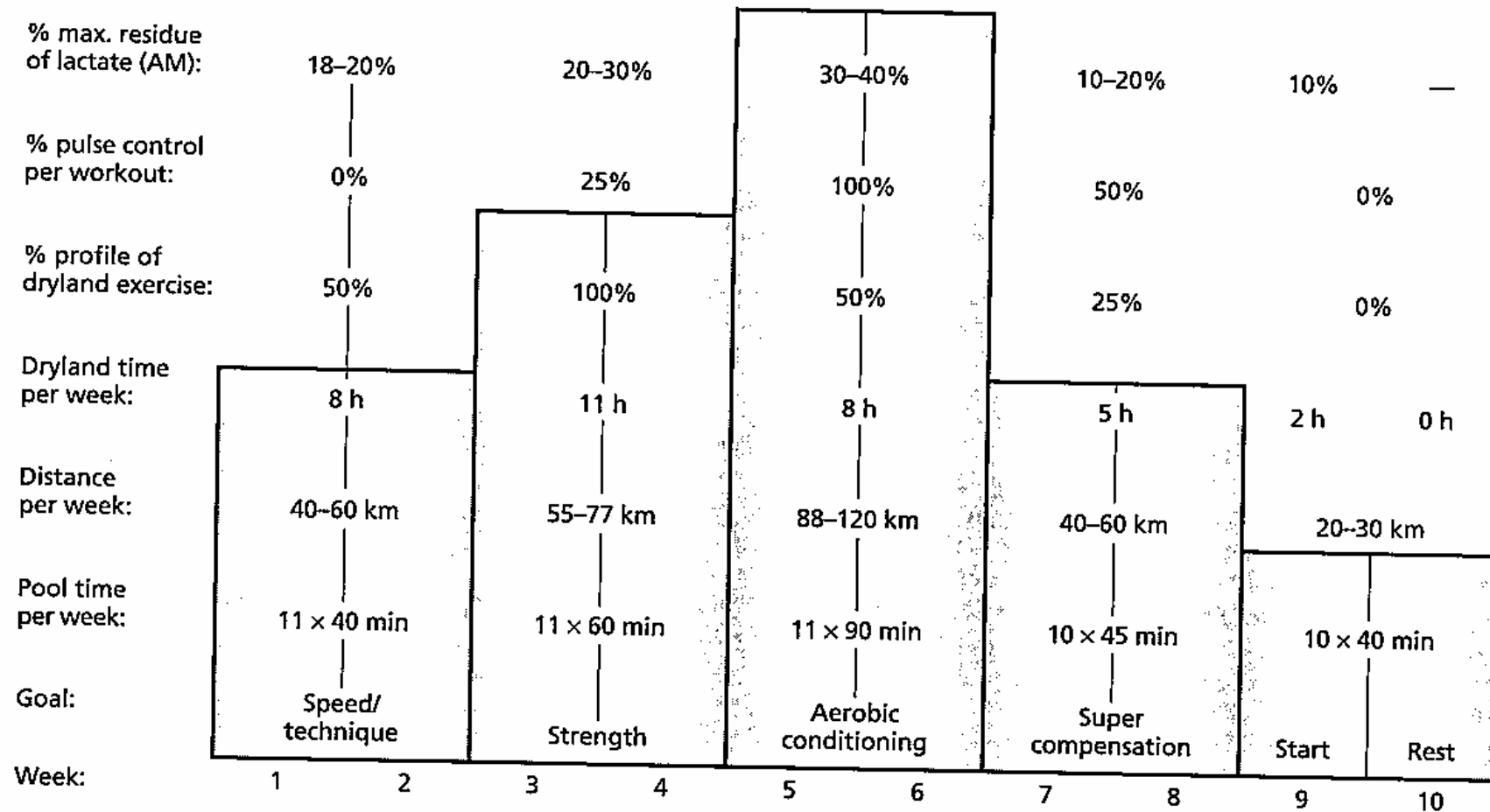


Fig. 55.4 Coach Koshkin's basic training pattern for 1500-m swimmer Salnikov and other Soviet top swimmers. The pattern is repeated five times a year in 10-week cycles. From Koshkin (1984).

# Vladimir Issurin & Vassili Kaverin, Canoe-Kayak

**Block Periodized system that includes:  
accumulation, transformation and  
realization mesocycles;  
duration of training stage – 6-10 weeks**

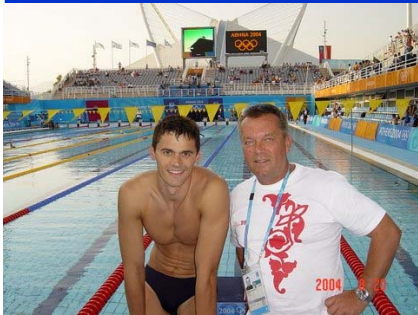
**Preparation outcomes – 3 gold and  
3 silver medals of USSR National  
Team at the Seoul Olympic Games;  
8 and 9 gold medals at World  
Championships of 1989, 1990**

**Publication: *Issurin, Kaverin, 1985,1989***



# The principal methodic demands to BP training were almost identical:

- 1) mesocycles-blocks where focused on minimal number of targets;
- 2) the total number of proposed blocks is relatively small;
- 3) the single mesocycle-block's duration ranges within two-fore weeks;
- 4) joining of single mesocycles forms training stage;
- 5) a number of training stages forms annual cycle



# Block Periodization **vs.** Traditional Theory

## TT

**Simultaneous** development of motor abilities and skills

**Medium (low)** concentration of training loads

Focus – training **periods**

Background – **cumulative** training effect

## BP

**Consecutive** development of motor abilities and skills

**High** concentration of training loads

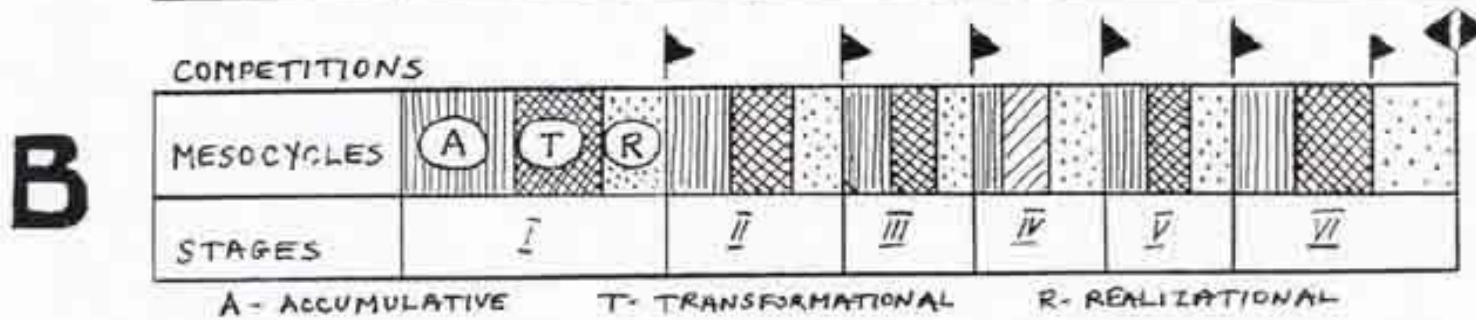
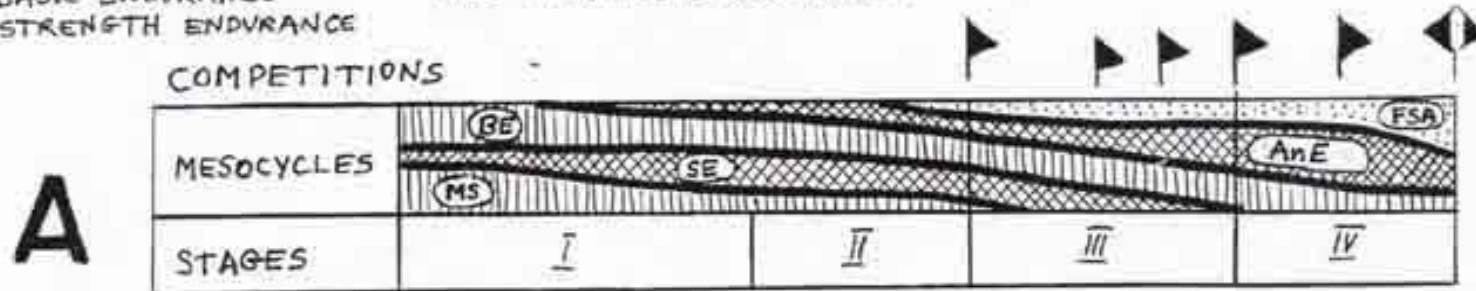
Focus – **blocks**-mesocycles

Background – cumulative and **residual** training effect



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ALTERNATIVE SCHEMES OF ANNUAL CYCLE TRAINING

# *Basic principles of BP*

- **High concentration of the training workloads**
- **Minimal number of abilities-targets within single block**
- **Consecutive development of many abilities**
- **Compilation and use of specialized mesocycles-blocks**

**Important**

# The cornerstones of Block Periodization

- **high training loads' concentration**
- **residual training effects**
- **consecutive development**
- **training blocks taxonomy**
- **peaking**



# High training loads' concentration

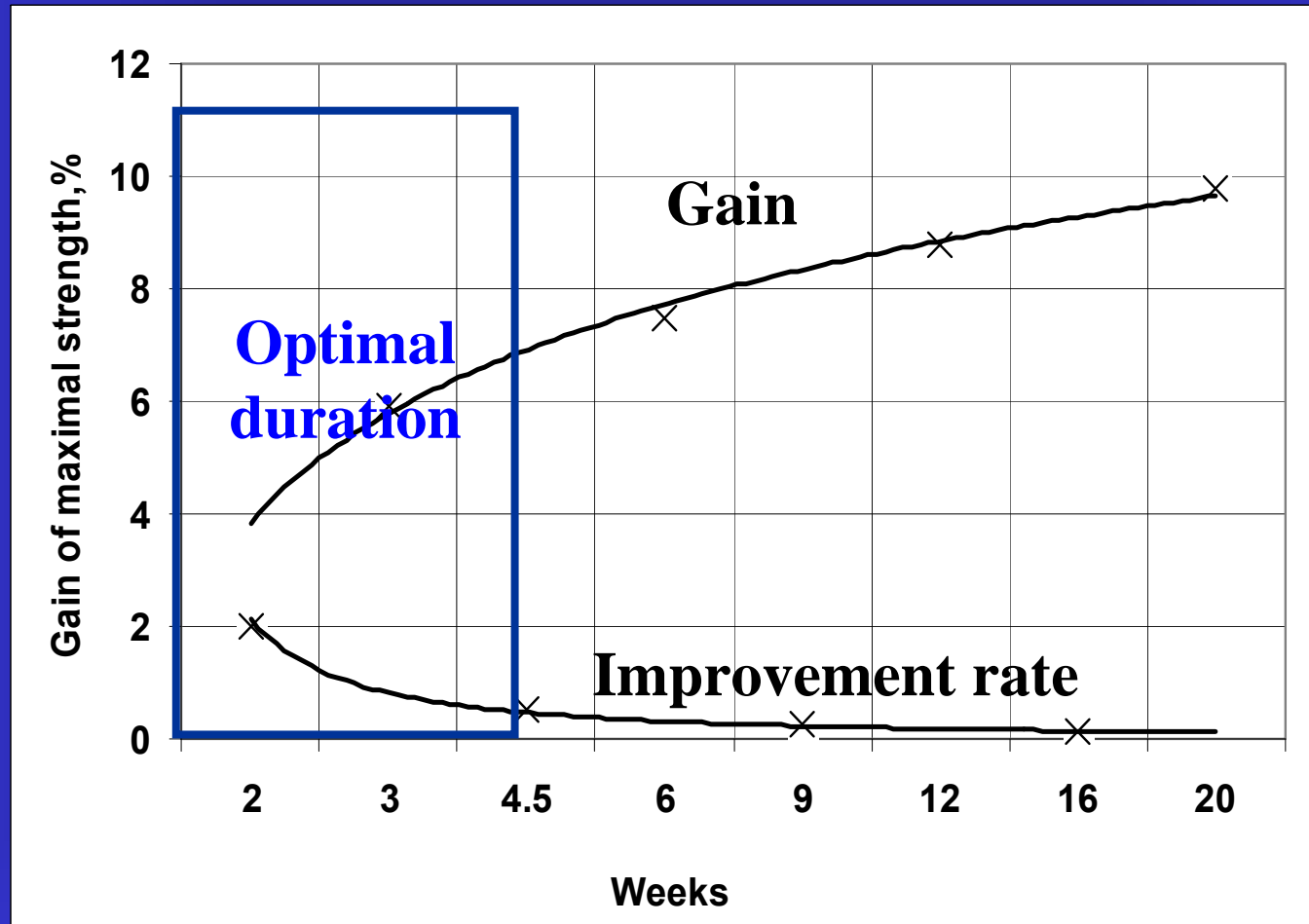


# Facts:

**In qualified athletes highly concentrated training loads only provide sufficient training stimuli**

**In elite athletes 60-70% of total training time is devoted to minimal number of targeted abilities**

# Typical gain and improvement rate of the maximal strength





# Residual training effects

# Prof. James Counsilman – great coach and scientist



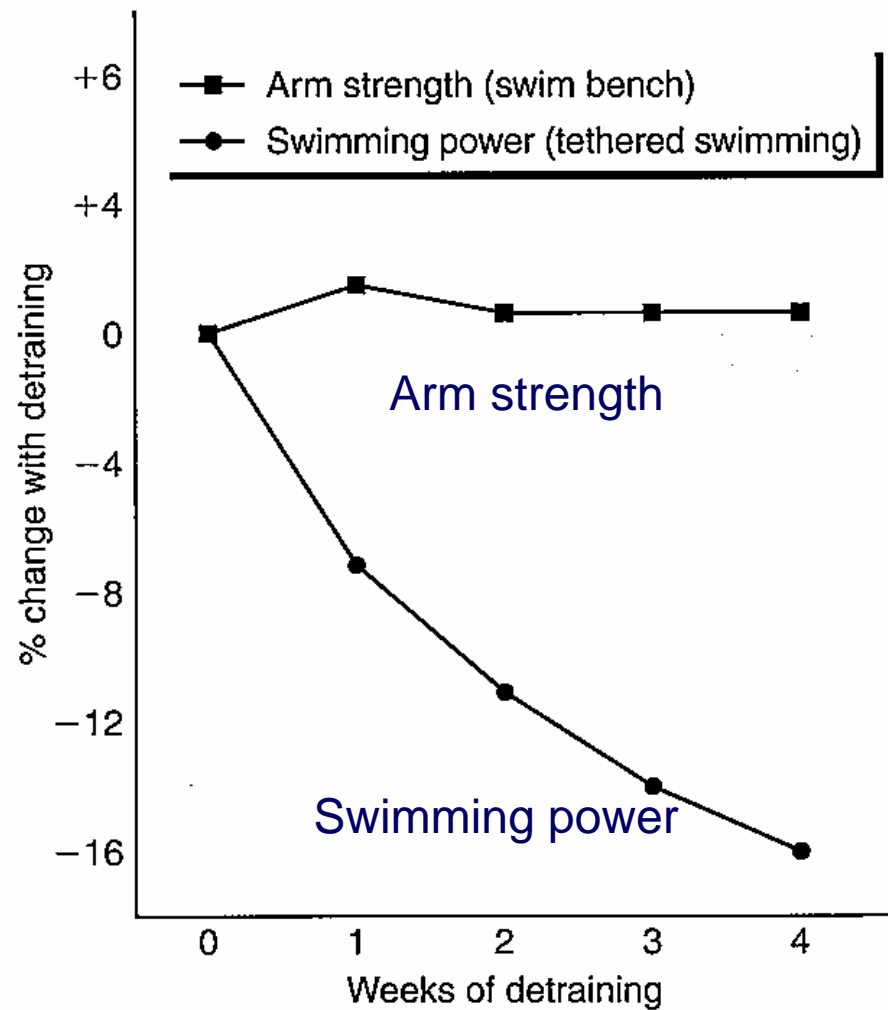
# Prof. James Counsilman – great coach and scientist



# Terminology

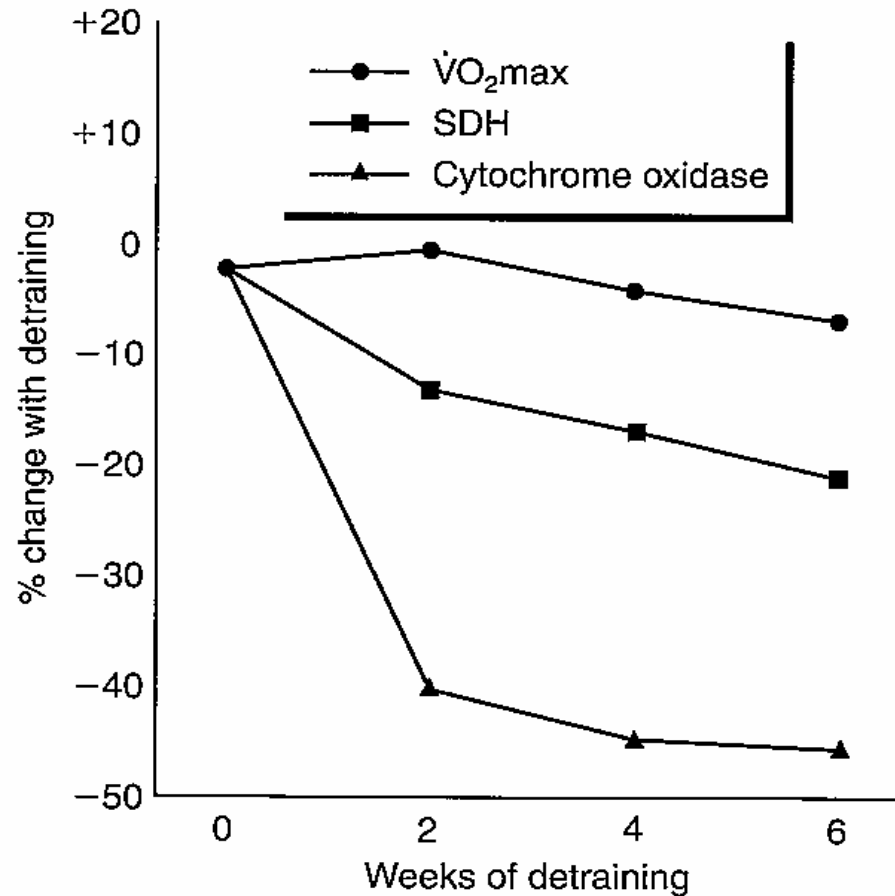
## Residual training effect:

- **retention of changes in the body state and motor abilities after the cessation of training beyond certain time period**



▲ **Figure 12.14** Changes in arm strength and swimming power during 4 weeks of detraining. Arm strength was assessed from performance on a swim bench (nonspecific), whereas swimming power was assessed from performance of tethered swimming (specific).





▲ **Figure 12.15** Percentage decreases in  $\dot{V}O_2\text{max}$ , muscle succinate dehydrogenase (SDH) activity, and cytochrome oxidase activity during 6 weeks of detraining. These interesting findings suggest that the muscles experience a decline in metabolic potential, although tests of  $\dot{V}O_2\text{max}$  show little change over this period of detraining.

## Blood Lactate, pH, and Bicarbonate ( $\text{HCO}_3^-$ ) in Eight Collegiate Swimmers Undergoing Detraining

Measurement	Weeks of detraining			
	0 <sup>a</sup>	1 <sup>b</sup>	2	4
Lactate (mmol/L)	4.2	6.3	6.8	9.7 <sup>c</sup>
pH	7.259	7.237	7.236	7.183 <sup>c</sup>
$\text{HCO}_3^-$ (mmol/L)	21.1	19.5 <sup>c</sup>	16.1 <sup>c</sup>	16.3 <sup>c</sup>
Swim time (s)	130.6	130.1	130.5	130.0

*Note.* Measurements were taken immediately after a fixed-pace swim.

<sup>a</sup>The values at week 0 represent the measurements taken at the end of 5 months of training.

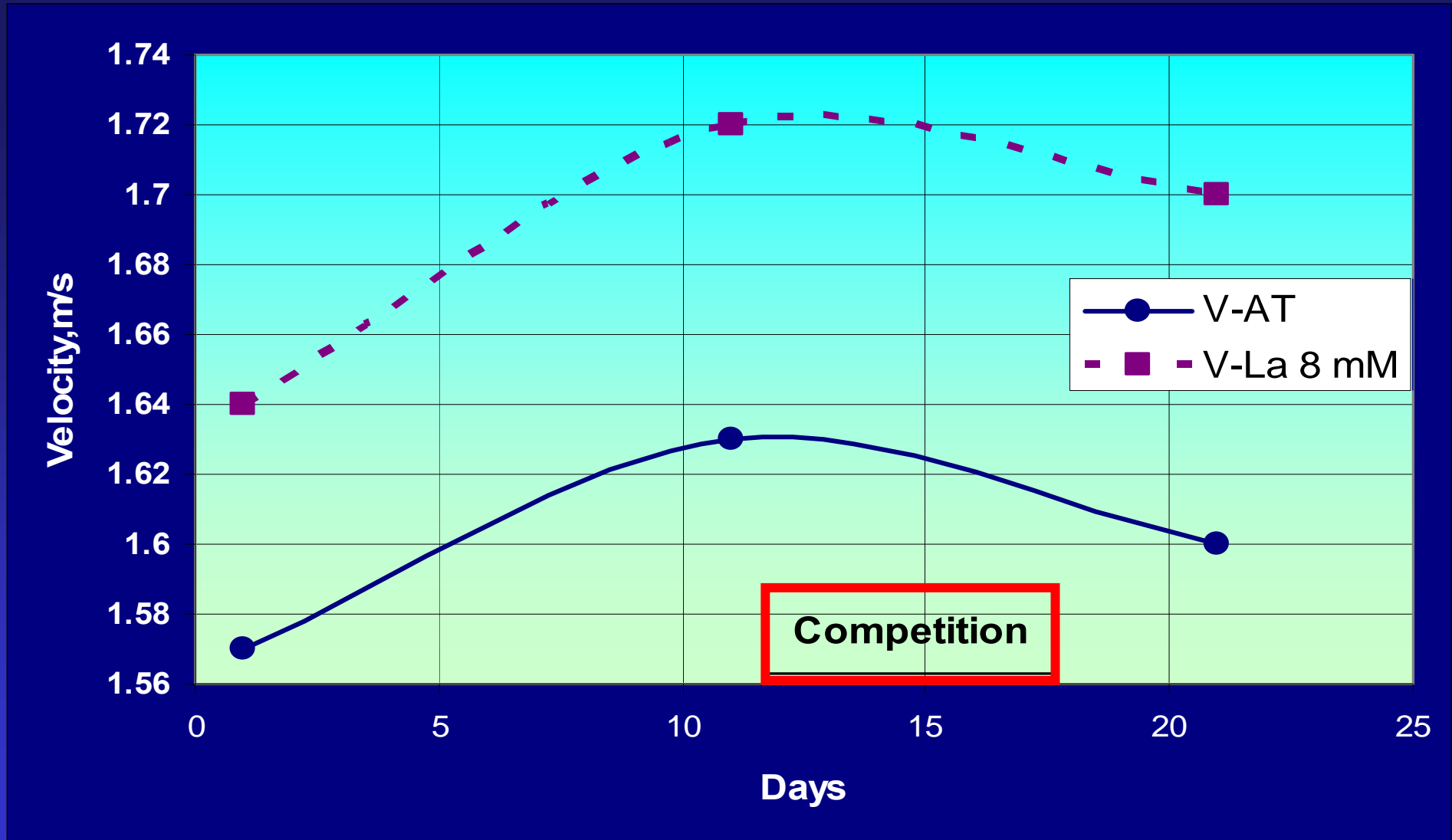
<sup>b</sup>The values for weeks 1, 2, and 4 are the results obtained after 1, 2, and 4 weeks of detraining, respectively.

<sup>c</sup>Significant difference from the value at the end of training.



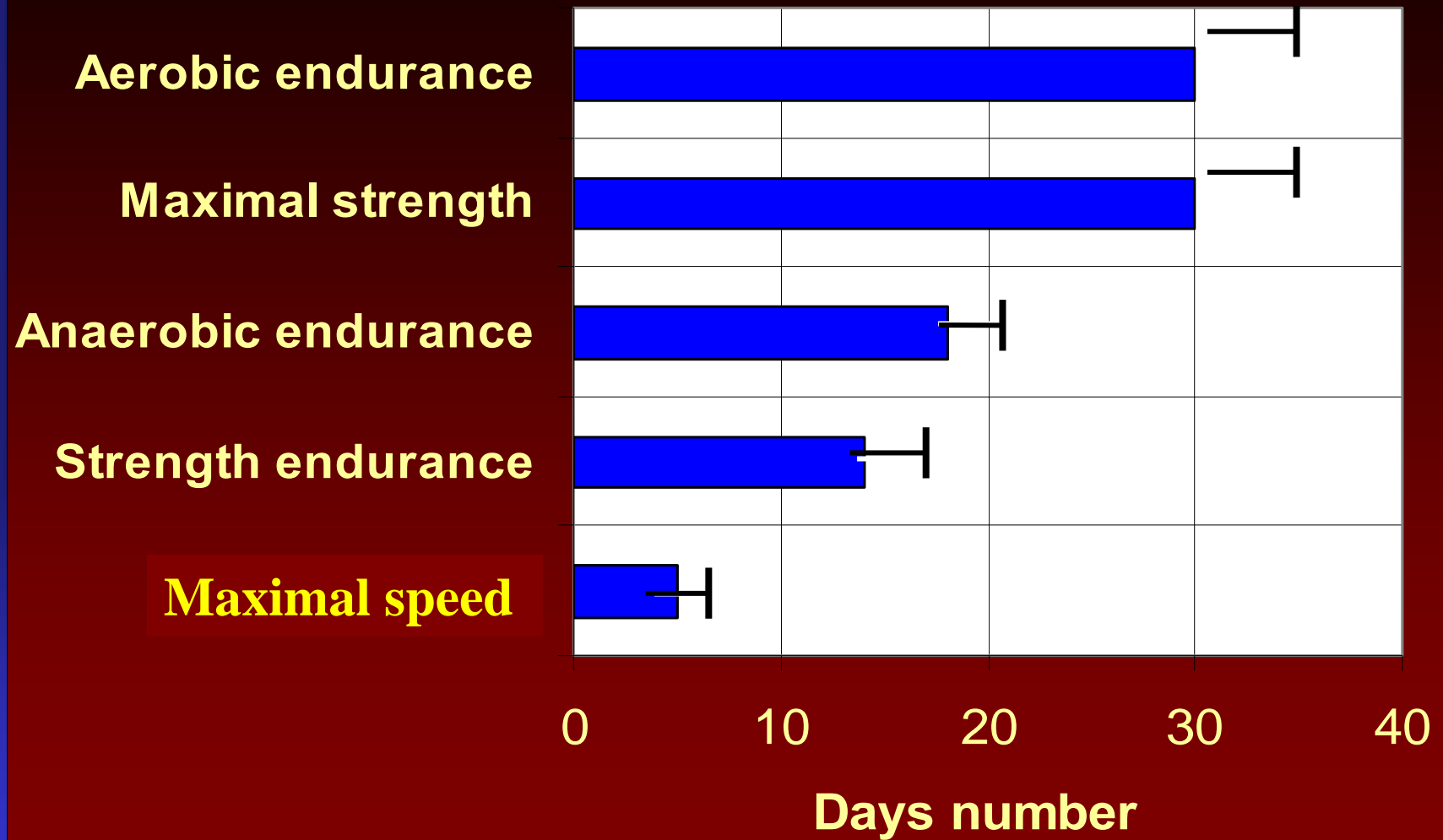
**Alexander  
Popov-  
5-times  
Olympic  
Champion**

# Alexander Popov's individual trend



*By courtesy of Gennadi Touretski*

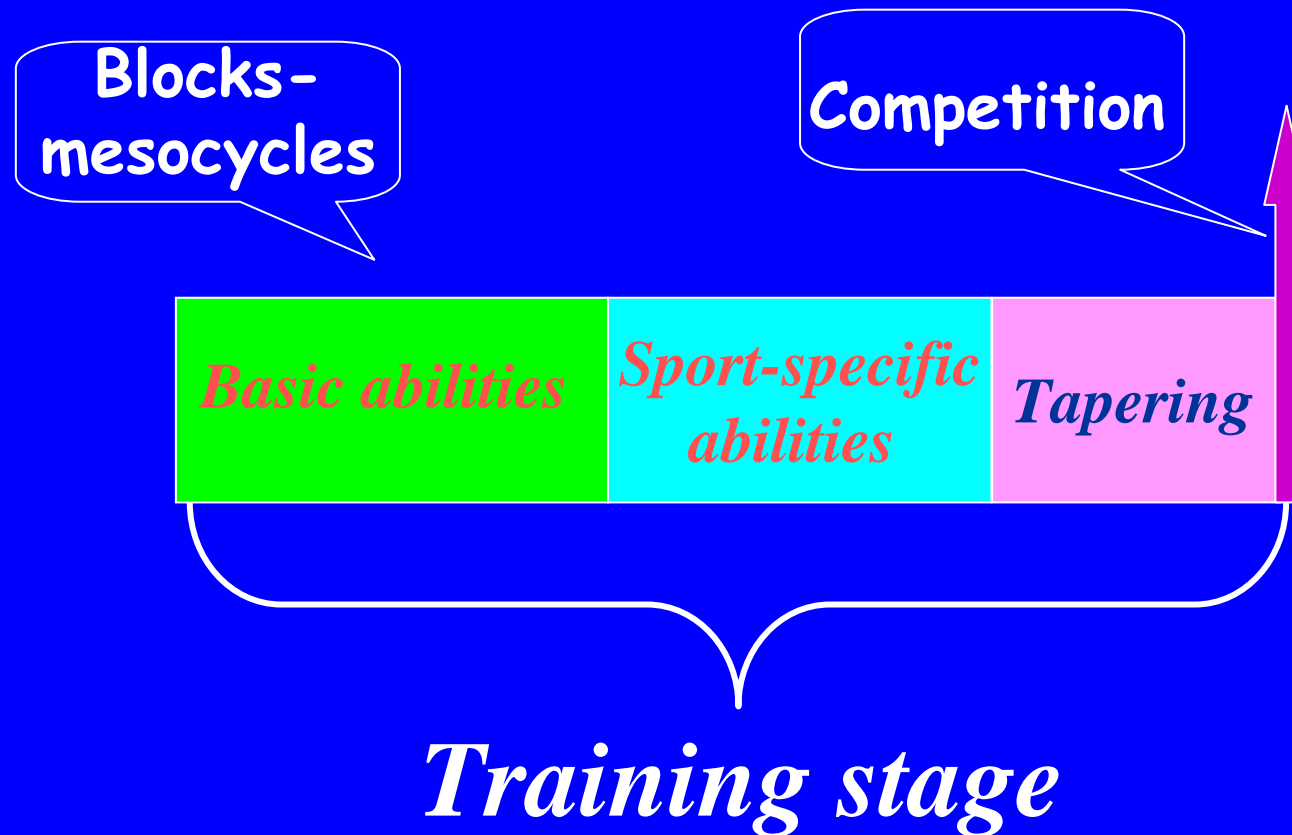
# Residual training effects





# Consecutive development

# Sequencing of training targets





# Training blocks taxonomy



## *Taxonomy of blocks-mesocycles*

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**Type**

**Accumulation**

**Abilities-Targets**

Basic motor and technical abilities:

aerobic endurance,  
muscular strength,  
basic coordination...

**Type**

**Transmutation**

**Abilities-Targets**

Specific motor and technical abilities:

anaerobic endurance,  
strength specific endurance,  
proper technique...

# *Taxonomy of blocks-mesocycles*

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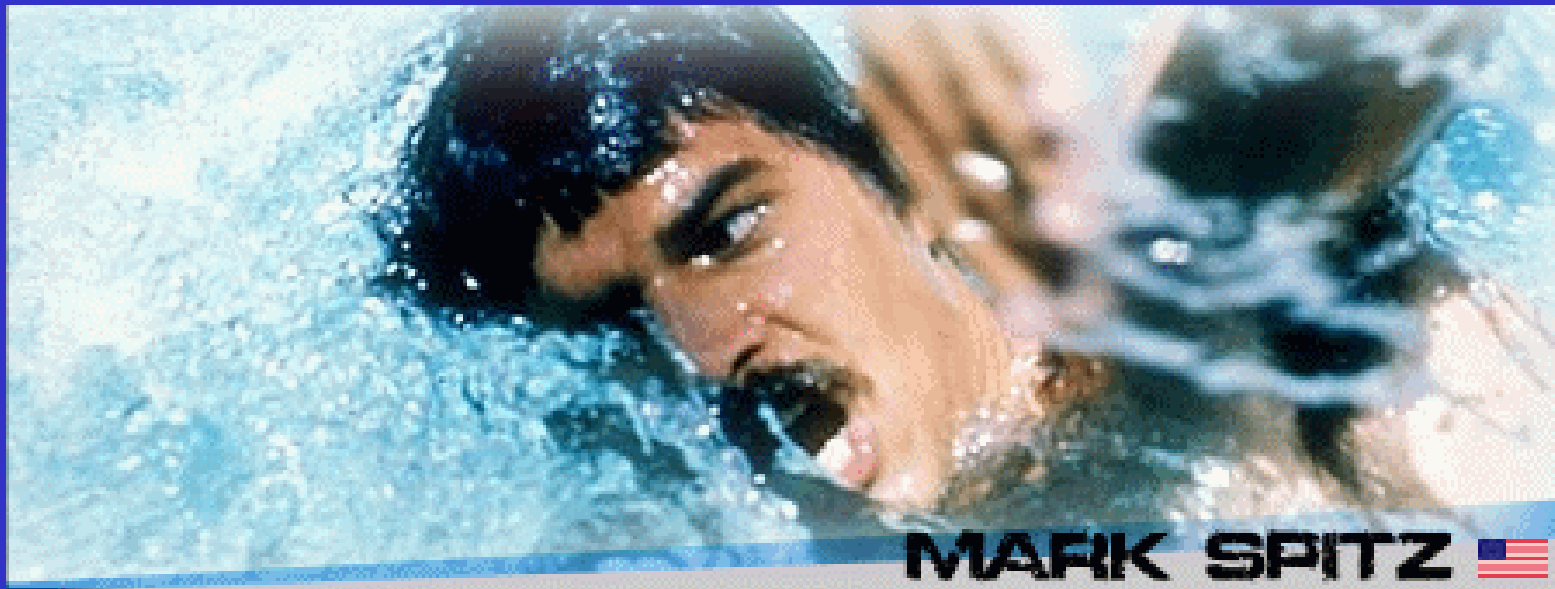
**Type**

**Realization**

**Abilities-Targets**

**Tapering:**

**full restoration,  
maximal speed and quickness,  
event specific readiness**

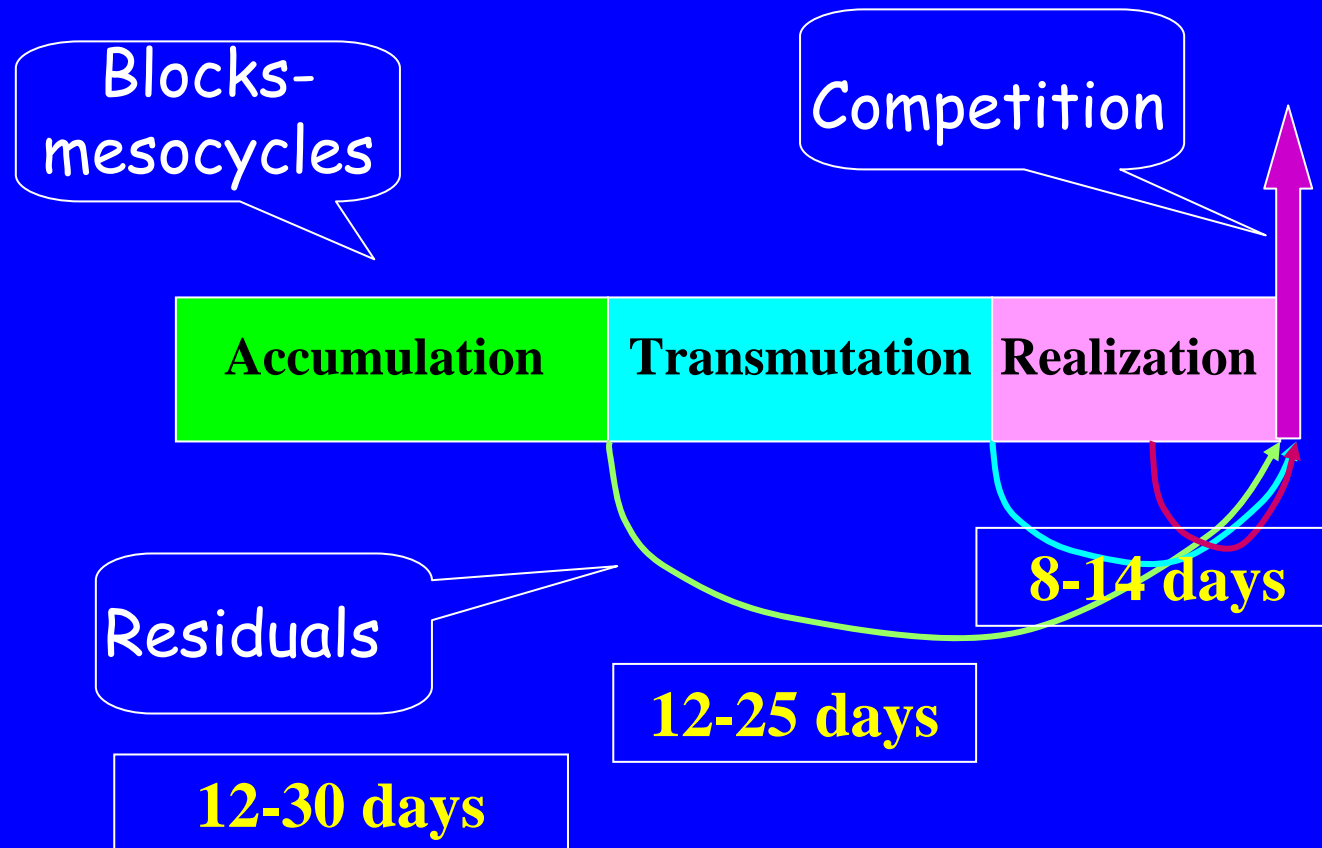


# Peaking

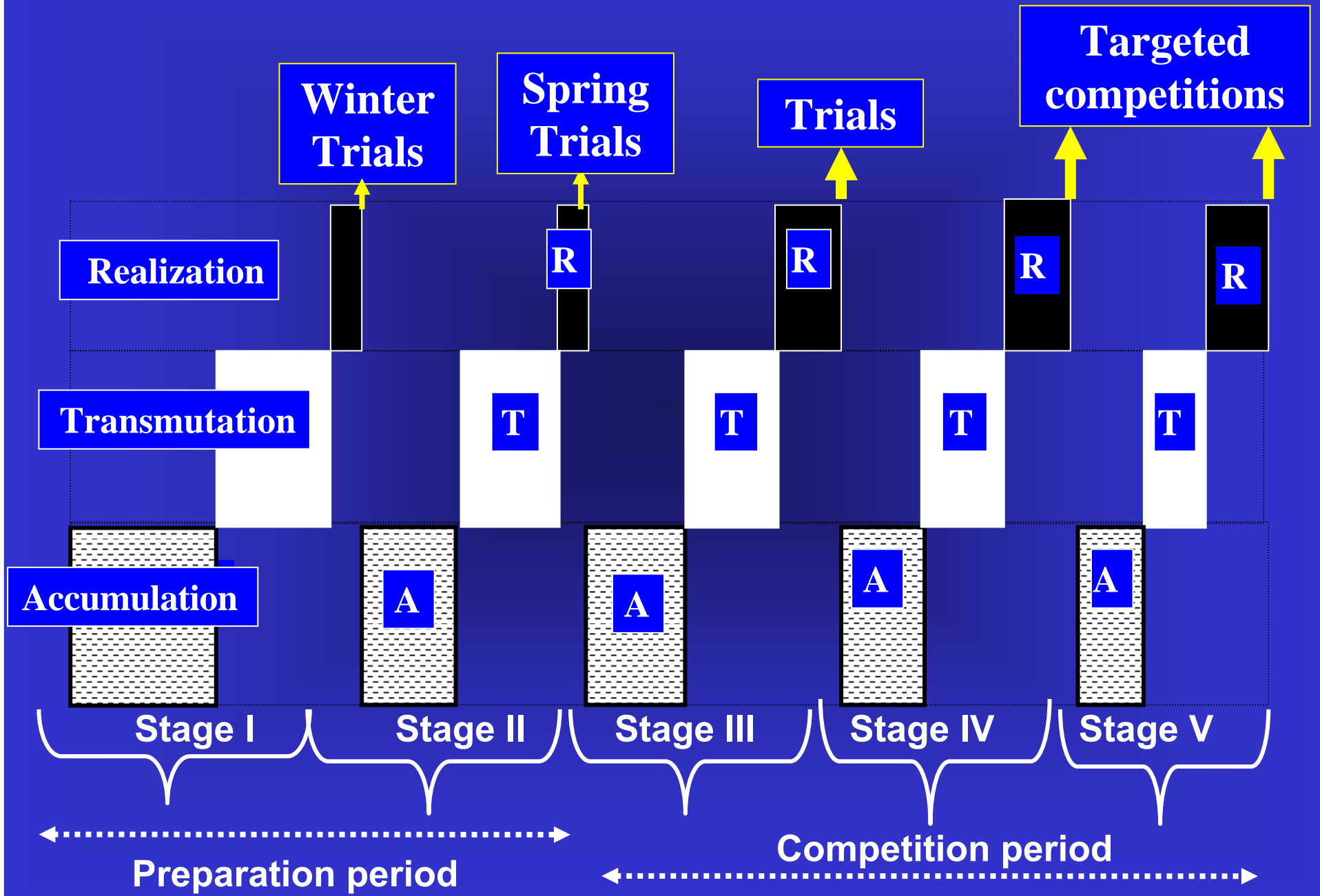
# Terminology

**Peaking** - obtaining the best athletic conditions at a particular moment

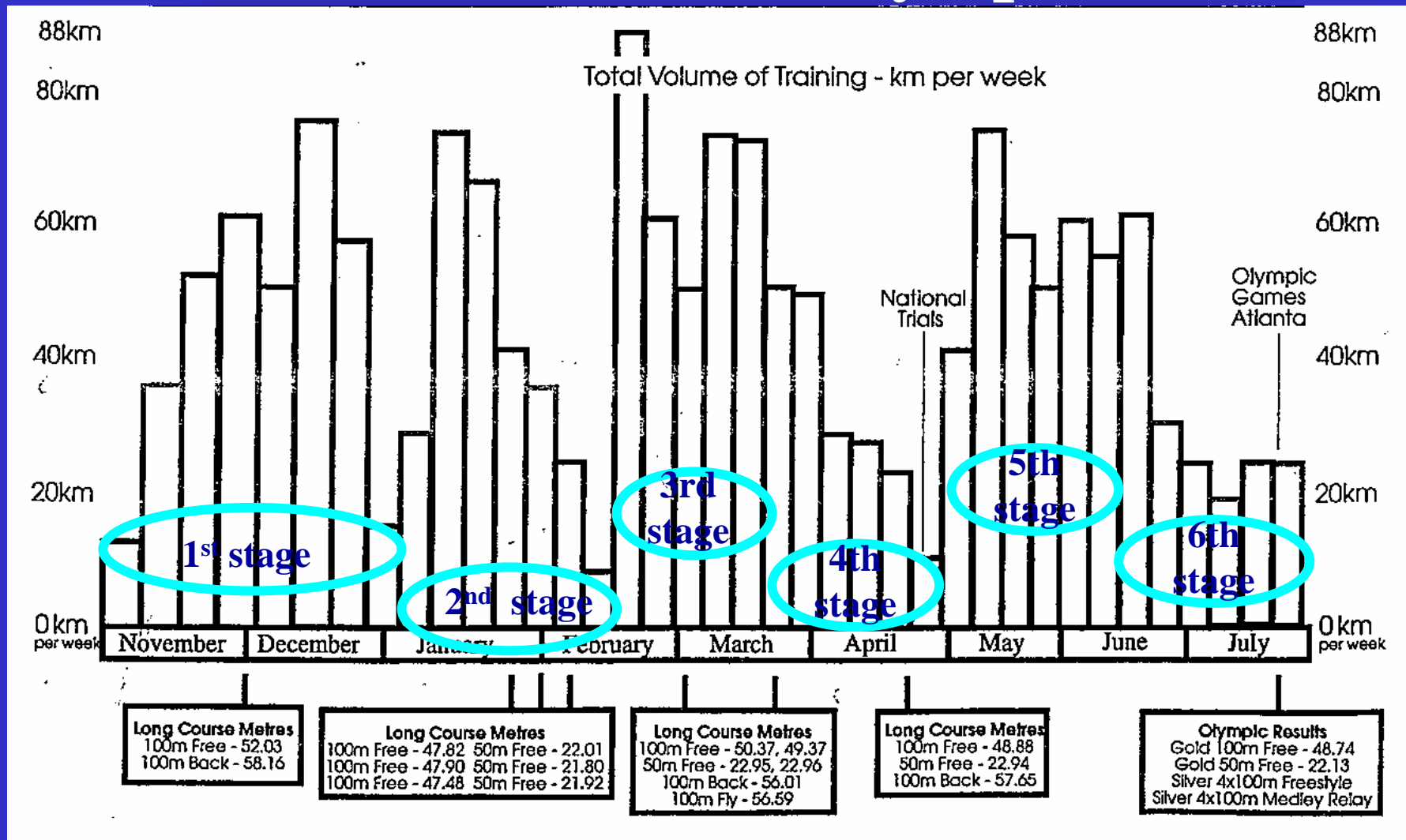
# Superposition of Residual Training Effects - Timing



# Annual Preparation Chart – Block Approach



# Annual preparation of Alexander Popov towards the Atlanta Olympic Games



By Courtesy of Gennadi Touretski



**One more example of the  
BP training implemented**

The 2006/2007 season was scheduled for macrocycle Traditional model 20-week (October-March) and Two ATR until the World Championship in Duisburg in August. It was the first time in the Spanish canoeing executing a program with ATR and I had serious problems to convince the technical direction and management of sport to achieve the macrocycle ATR. The results in Duisburg 2007 were not spectacular but **I used to learn a lot about the Block Periodization and convince my Head coaches to program in the 2007/2008 season five ATR until the Olympic Games.**

Carlos Perez and Saul Craviotto had no qualification for the Olympic Games and we had to get it in the European Championship in Milan. They had not ever done K-2 until January 2008. **In May they were 2° place in Europe Championship in Milan and in August were Olympic Champions. The Block Periodization had been helpful, two peaks so high in so short time.**

*Jesus G. Pallares  
National Canoeing Coach*



*Saul Craviotto and Carlos Perez (ESP) -  
Olympic Champions*

**Biological  
background of  
Block Periodization**



**Claude  
Bernard**

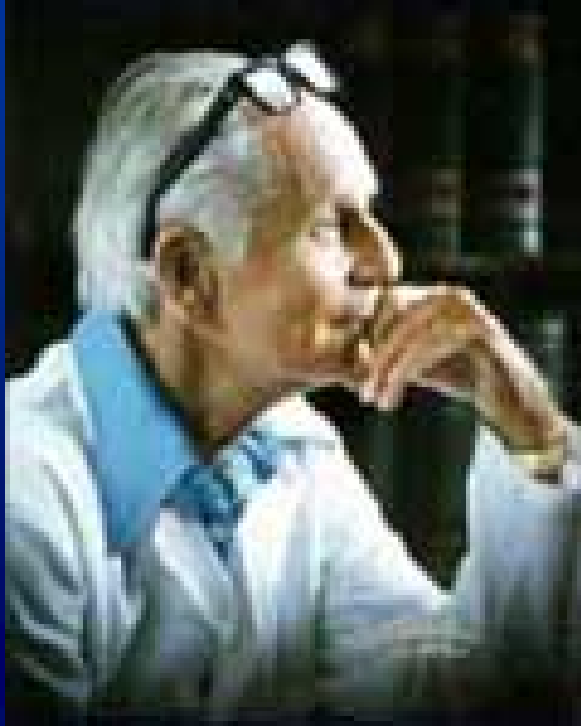
*Classic theory  
of  
homeostasis  
– maintaining  
the constancy  
of body's  
internal  
milieu*



**Walter  
Cannon**

**Homeostatic regulation is a predominant mechanism for developing basic sport abilities like *cardiorespiratory fitness, general neuro-muscular coordination, and morphological and organic adjustment of the musculoskeletal system.* Therefore, homeostatic regulation serves as a dominant mechanism of adaptation to training in the early stages of long-term athletic preparation and for developing of basic motor and technical abilities in high-performance athletes.**

**In terms of BP these cycles are specified as *accumulation mesocycle-blocks.***



**Hans  
Selye**

*Classic theory  
of  
mechanisms  
of stress and  
general  
adaptation*

" Another major pathway involved in the stress mechanism is carried through the ***catecholamines*** liberated under the influence of an acetylcholine discharge, at autonomic nerve endings and in the adrenal medulla"

**The Nature of Stress**  
by Hans Selye



The strong training stimuli elicited by workloads of high intensity mobilize the athlete's energy resources in amounts that exceed the metabolic level necessary for homeostatic response. These increased demands trigger off profound endocrine responses, i.e., the **secretion of stress hormones**. Thus, highly intensive anaerobic glycolytic exercises produce a pronounced catecholamine response (*Viru, 1985,1995*), and the rapid secretion of cortisol, corticotropin and  $\beta$  –endorphin (*Lehman, Keul,1981* ) .

In terms of BP this training specified as *transmutation mesocycle-blocks*.

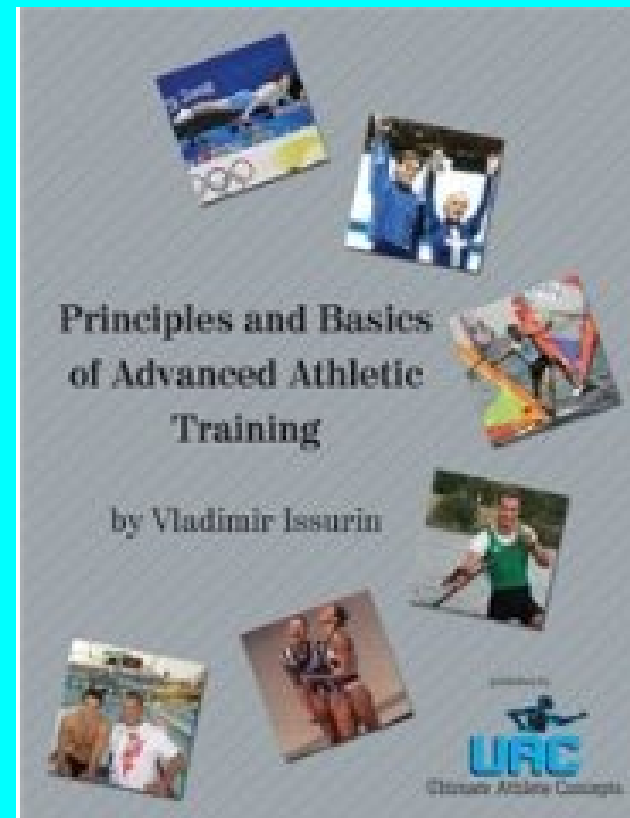
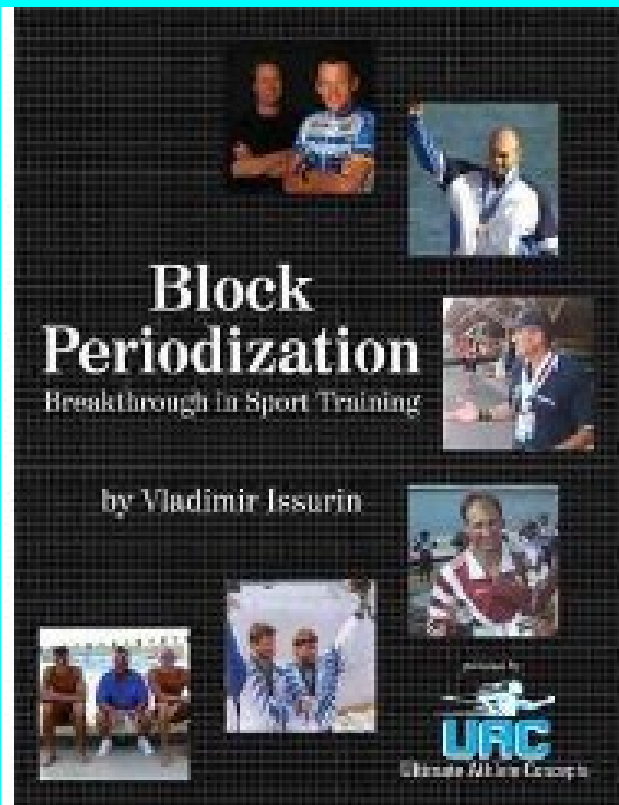
## *Interaction of homeostasis and stress reactions*

Preparation that entails the use of both types of training concurrently demands energy needs that surpassing the limits of homeostatic regulation. Correspondingly, stress reactions become stronger. This more strained metabolic and hormonal body environment **suppresses** homeostatic responses and has a **deleterious** effect on workloads intended to develop basic athletic abilities. Such conflicting responses, which are typical of mixed training among high-performance athletes, lead to a **decline** in general aerobic abilities, a reduction in muscle strength and cases of overtraining.

BP model allows to avoid such conflicting physiological responses and exploits the most appropriate mode of biological adaptation.



**How to accomplish these knowledge?**



**What people are  
saying ?**



## *Gennadi Touretski*

*Personal coach of many-time world and Olympic champions Alexander Popov (RUS) and Michael Klim (AUS)*



*My familiarity with the study outcomes of Vladimir Issurin cover a long period of cooperation and friendship. I believe the Block Periodization will assist anyone who is searching for new sources of information on how to improve training and obtain higher achievements.*

# Conclusions

- 1. Block Periodization as an alternative training approach is worthy for learning and implementation in the preparation of high-performance swimmers**

**2. Basics of Block Periodization are formed by general principles of BP (1), taxonomy of mesocycles-blocks (2), and guidelines for compiling annual cycle (3)**



### **3. Biological Background of Block**

**Periodization is closely connected with two fundamental contributors of human adaptation:**

- classic theory of homeostasis, and**
- mechanisms of stress adaptation**

A photograph of two women swimming in clear blue water. They are both smiling and have their arms raised in the air. The water is a vibrant blue, and the scene is captured from an overhead perspective. The text 'Thank you for your attention' is overlaid in the center in a white, sans-serif font.

**Thank you  
for your  
attention**