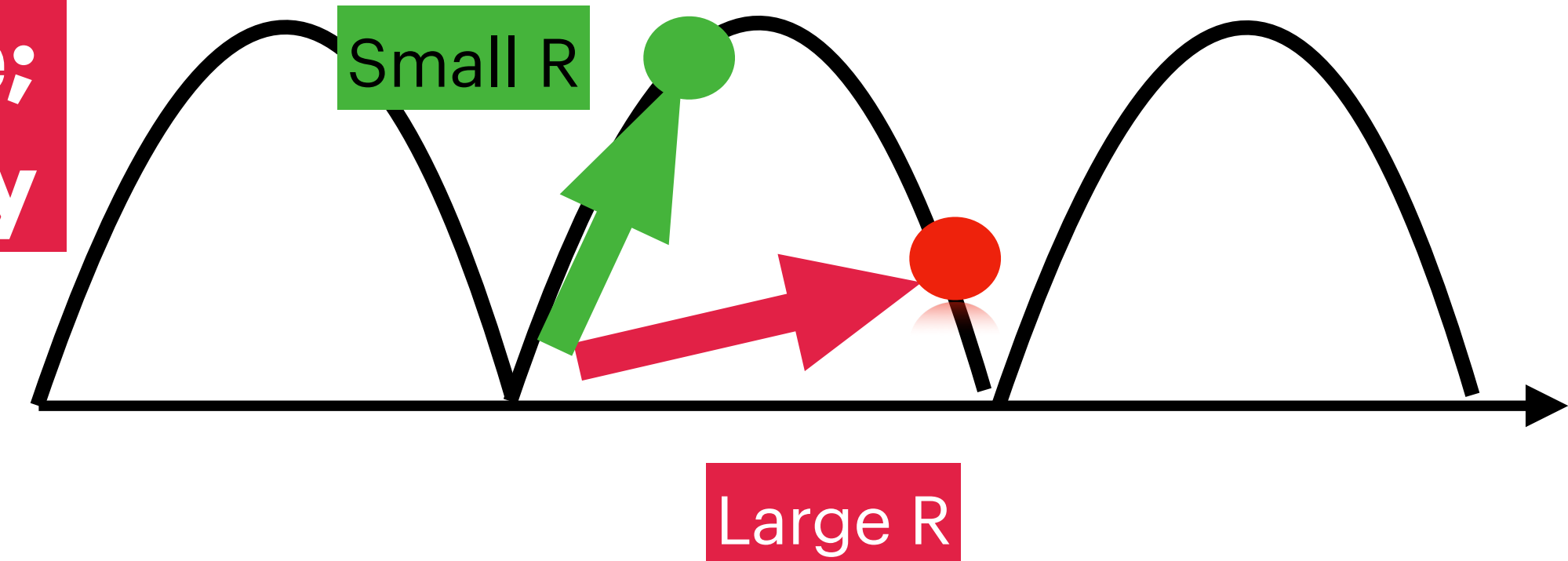
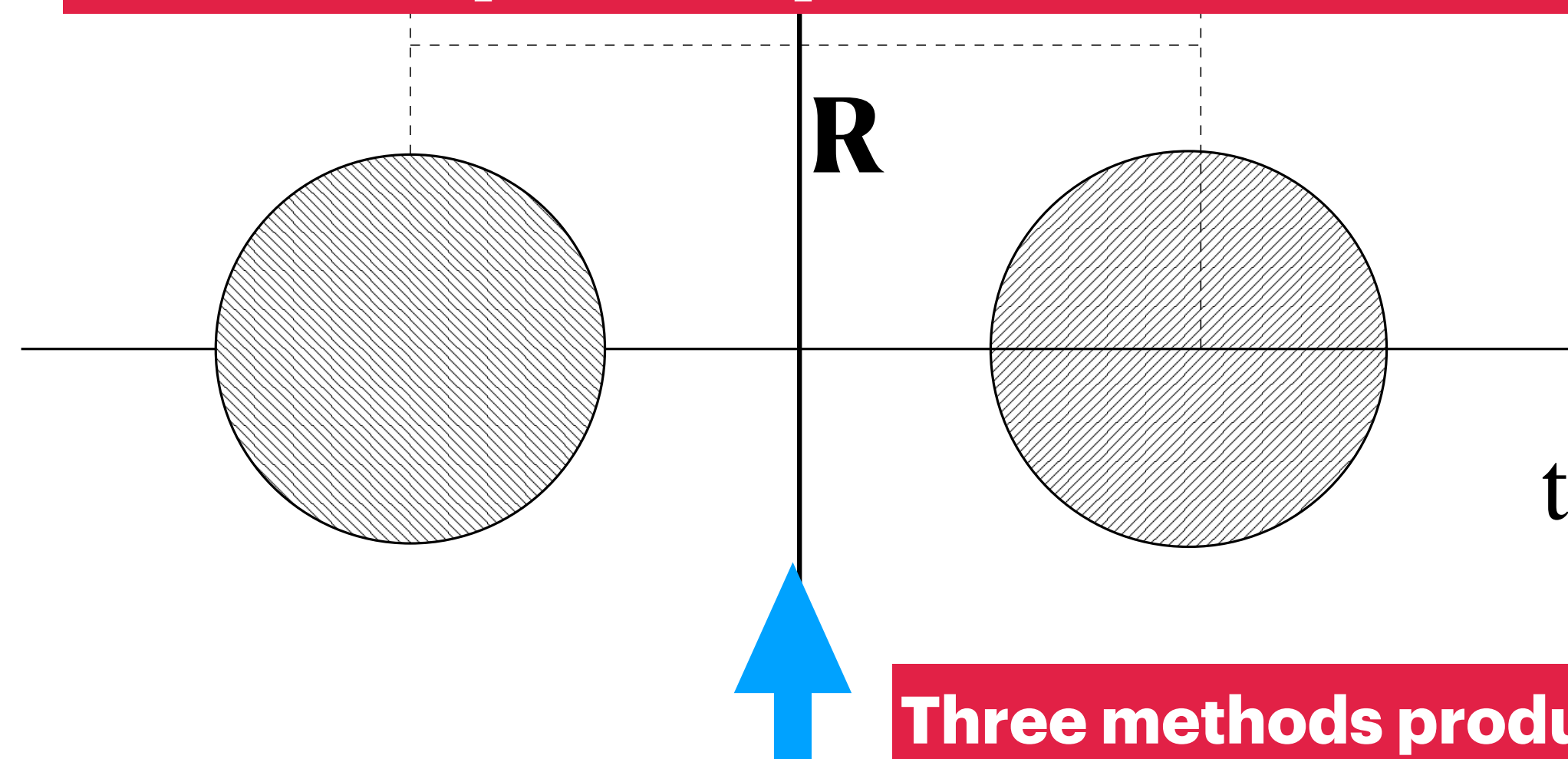


Thanks to organizers, I have not seen/discussed with many of all these uses since 1990's...

- Do we have quantitative (or qualitative) formulae for cross sections?
- Do we understand what is to be produced?

$$\sigma \sim (\text{entrance factor})(\text{semiclassical prefactor})\exp(-S_{cl})$$

**We do understand (i) the landscape;  
(ii) the optimal path to another valley**



If  $NCS < 1/2$  the configuration rolls back!  
Therefore one can save only about  
 $1/2$  of the action!

**Whatever ansatz is used,  
the produced object is  
Pure magnetic at  $t=0$**

**Three methods produced the same map**  
1.Verbaarschot solution (or Yung Ansatz)  
2.constrained minimization  
3.conformal off-center transformation

**Semiclassical prefactor:  
Which Lambda?  
What are corrections?**

$$\left(\frac{\Lambda}{\rho}\right)^{b_0} (1 + C\alpha_s + \dots)$$

**Semiclassical series**

FOR DOUBLE WELL INSTANTON  
CALCULATED TWO AND THREE LOOPS

F. Wöhler and E. Shuryak, Phys. Lett. B 333, 467-470 (1994)

Three-loop Correction to the Instanton Density. I. The Quartic Double Well Potential

M.A. Escobar-Ruiz, E. Shuryak, A.Turbiner: Phys.Rev.D 92 (2015) 2 · e-Print: **1501.03993**

**New diagrams, orthogonality to zero modes  
Not easy to obtain propagator  
Calculation for QFT ( $\phi^4$  and YM) in progress  
CORRECTIONS ARE LARGE**

Comparison to lattice  
Large T  $\rightarrow$  dilute instantons

**WUPPERTAL-BUDPEST COLLAB:  
CORRECTION TO T'HOOFT IS ABOUT FACTOR 10**

## THE ENTRANCE FACTOR

A proton is complicated, so what is it colliding, producing a sphaleron?

Version 1: two gluons

Pro: we know gluon PDFs, if we know the normalization scale  $\mu$

This depends on which size /mass of sphaleron we want to see  
If multi-gluon jet decays  $\rightarrow$  M about 100 GeV,  $\rho$  like  $1/(10 \text{ GeV})$   
Mueller, Khoze  $\rightarrow$  perturbative corrections, BFKL pomeron

Version 1: two Pomerons

Pomeron, unlike a gluon, has its own size  
And it is clear optimal size  $\rho$  is that size

$$s^{\alpha' t}$$

That is why I propose to start with double diffraction:  
**MAXIMAL CROSS SECTION (min. Action)**  
**NO messy underlying event**  
**UA8 already seen some clusters which fit the mass**