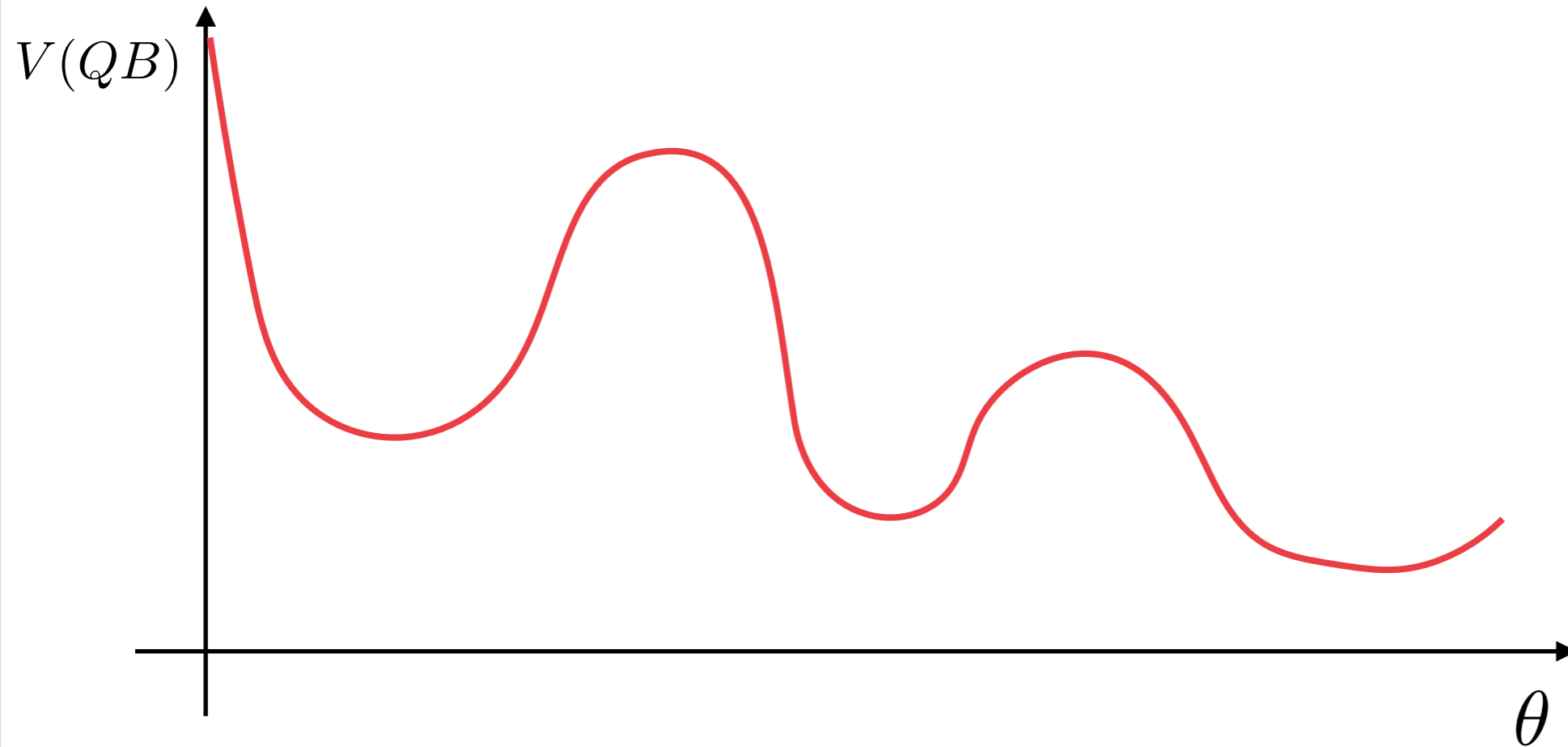


BSM physics up and down : axions, SUSY (breaking) and swampland conjectures

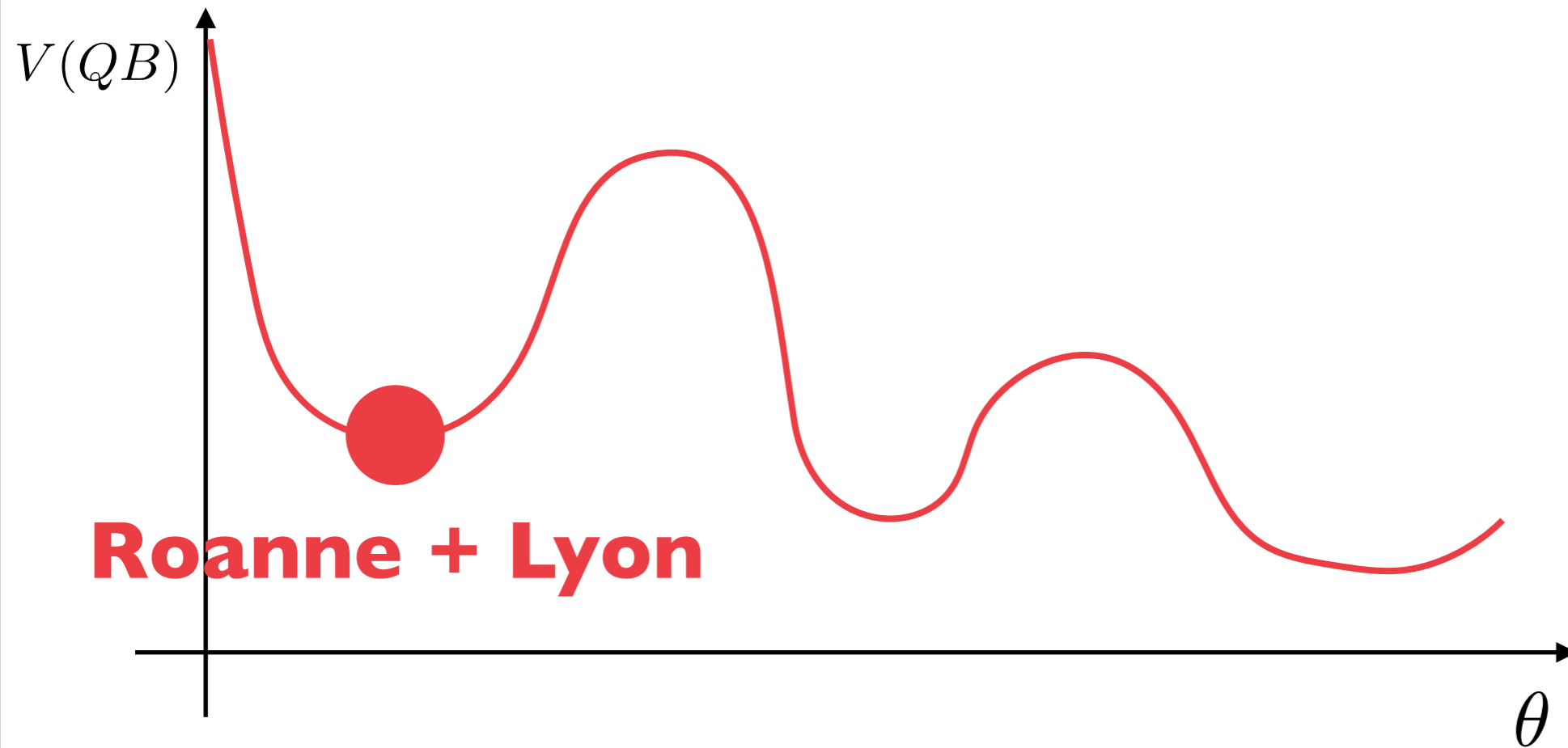
Quentin Bonnefoy

DESY fellows day 2019

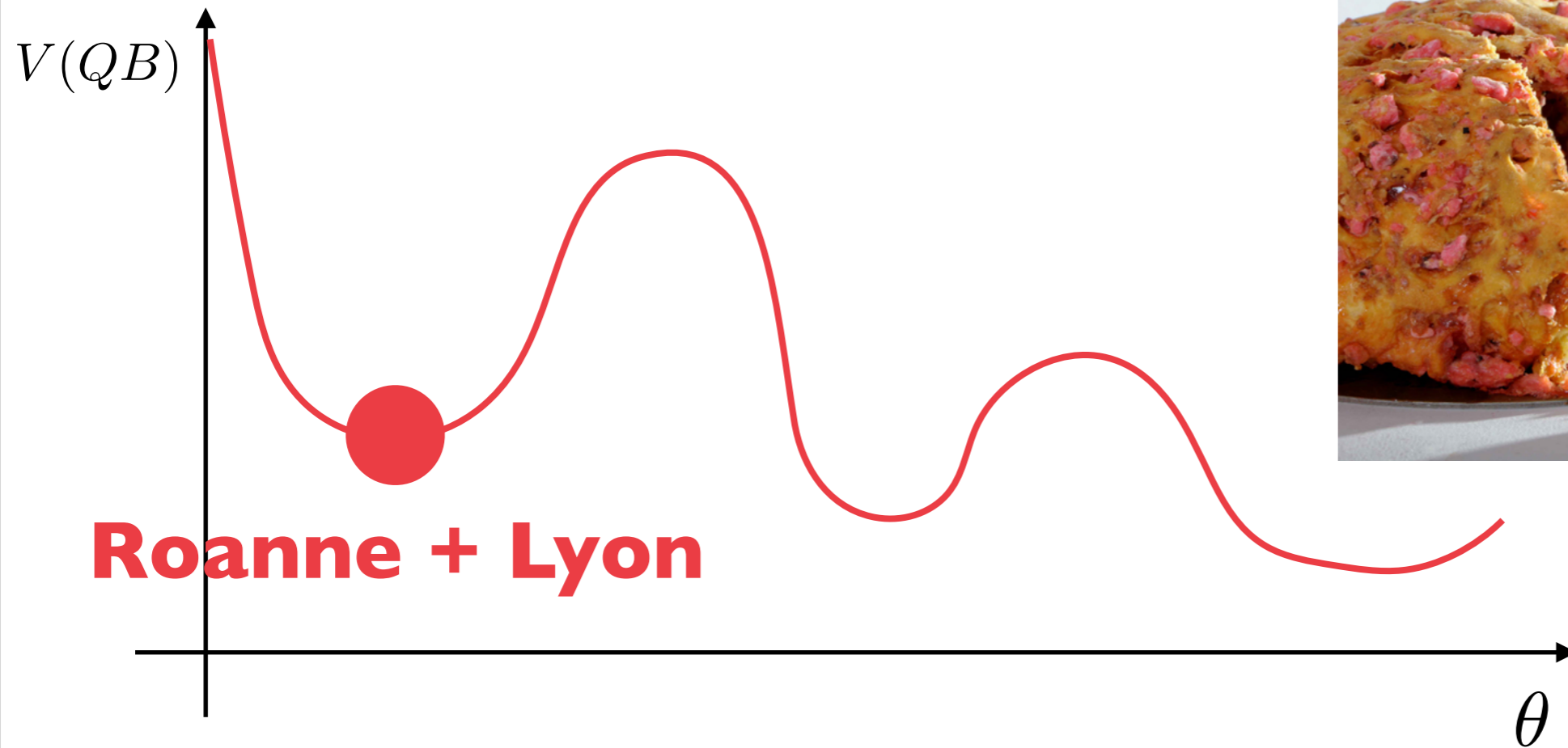
My phase transitions



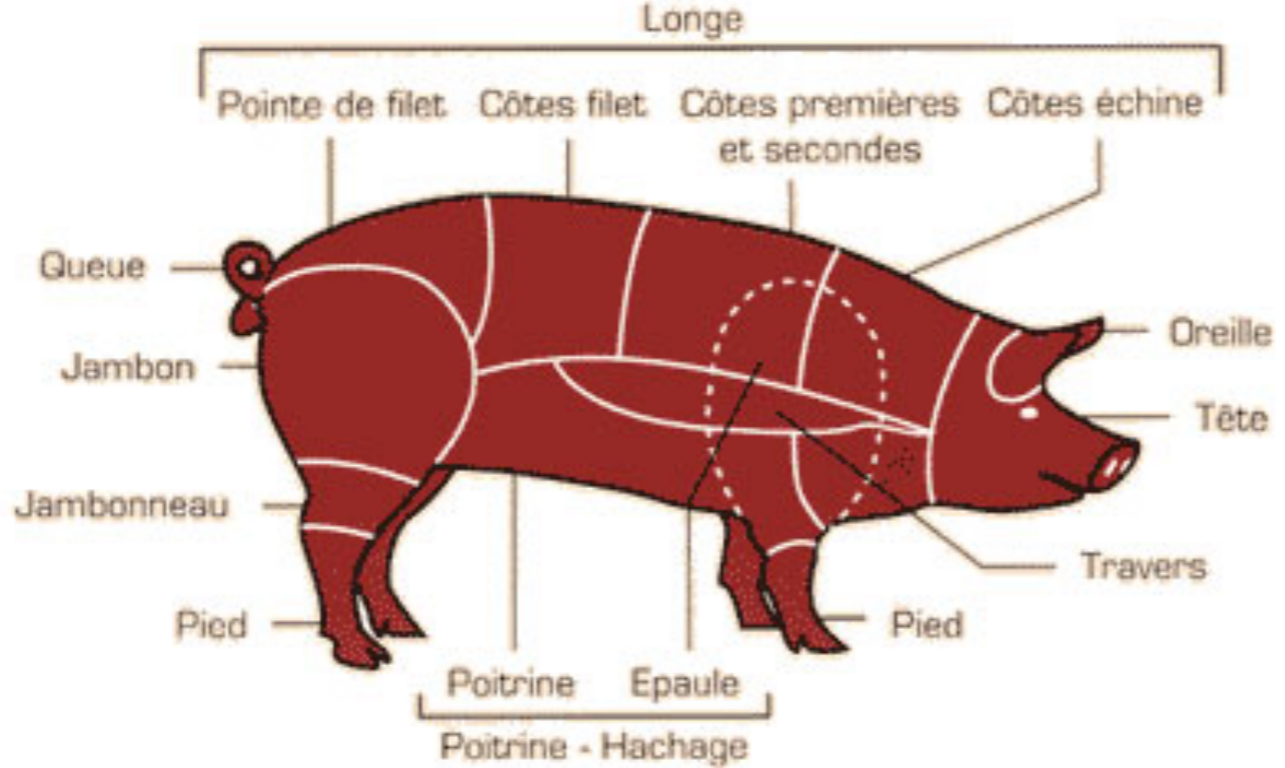
My phase transitions



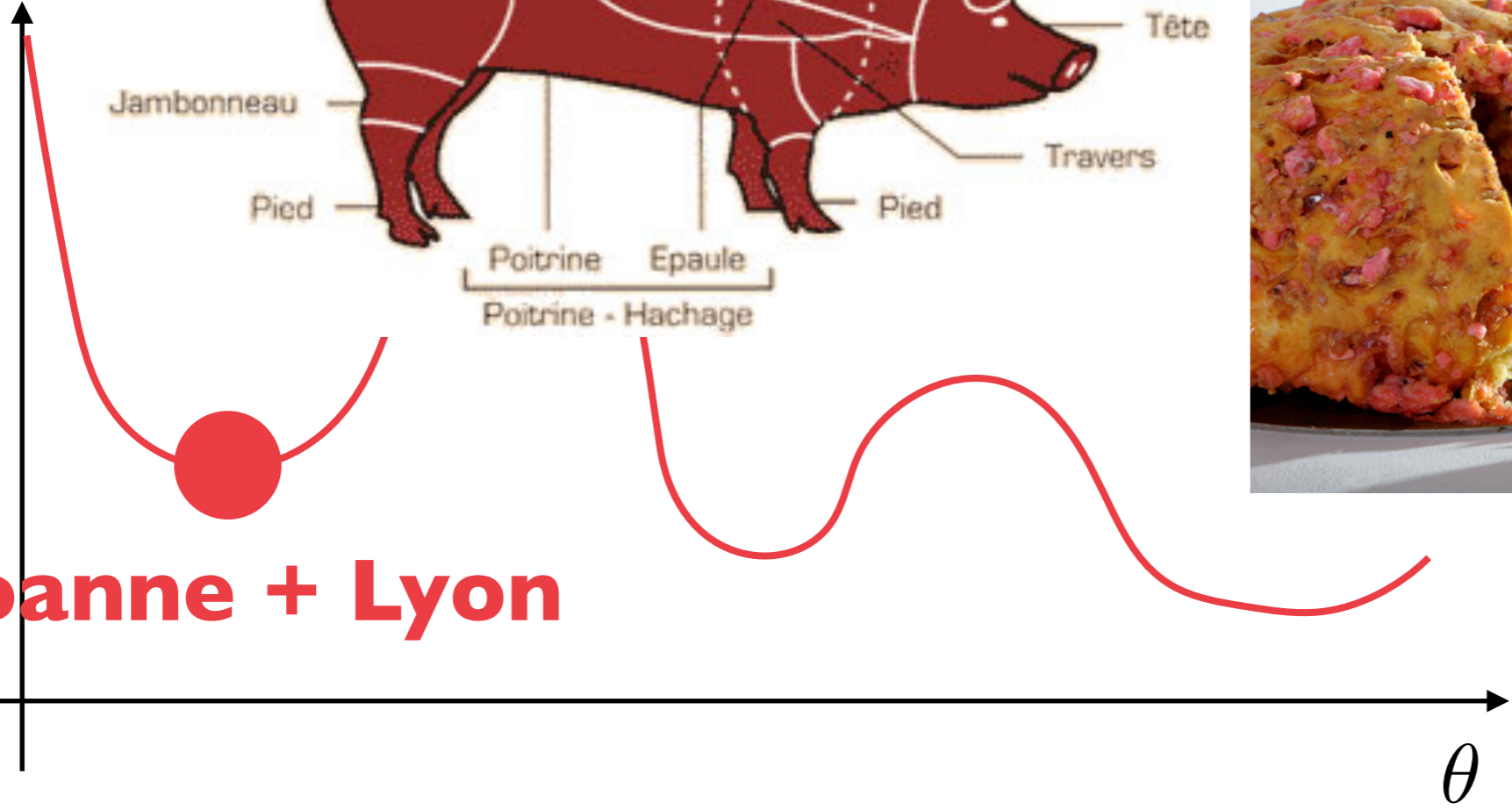
My phase transitions



ons



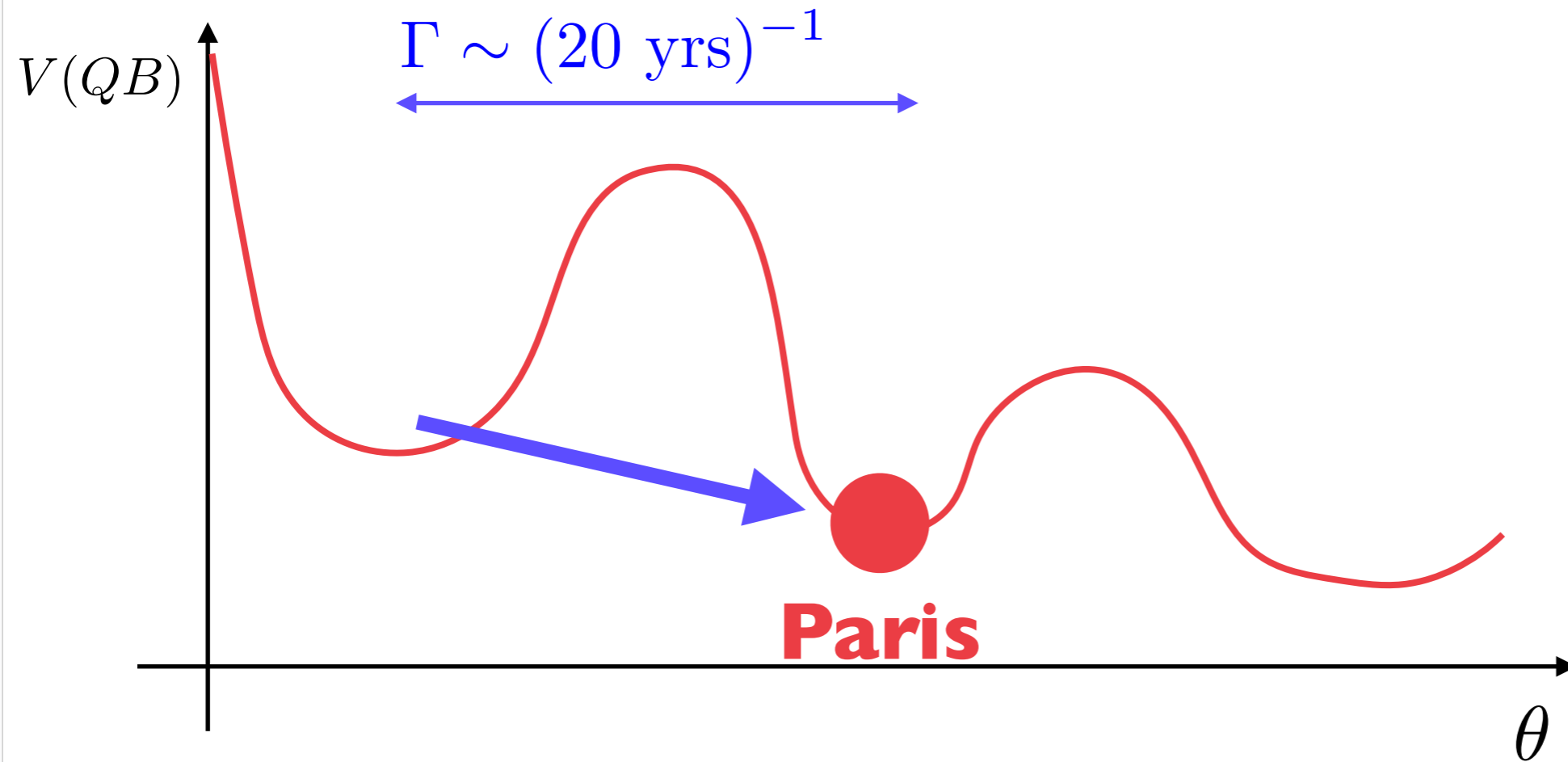
$V(QB)$



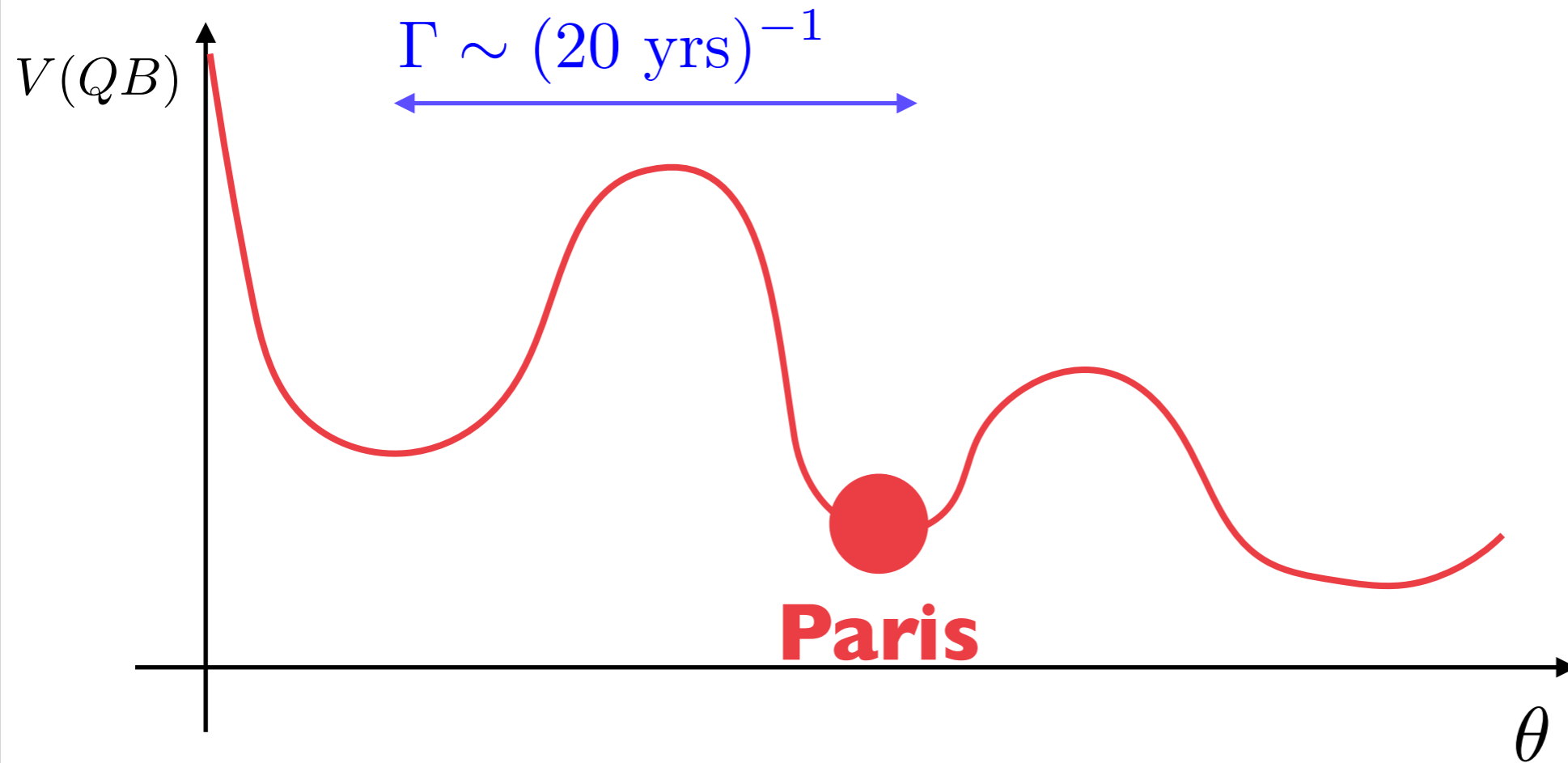
Roanne + Lyon



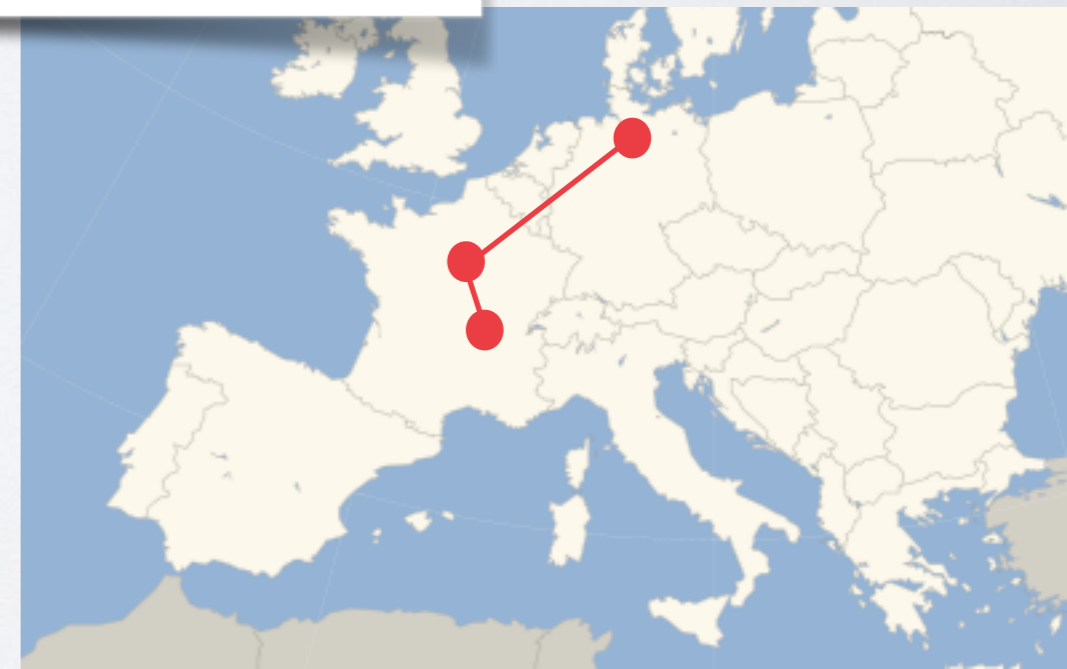
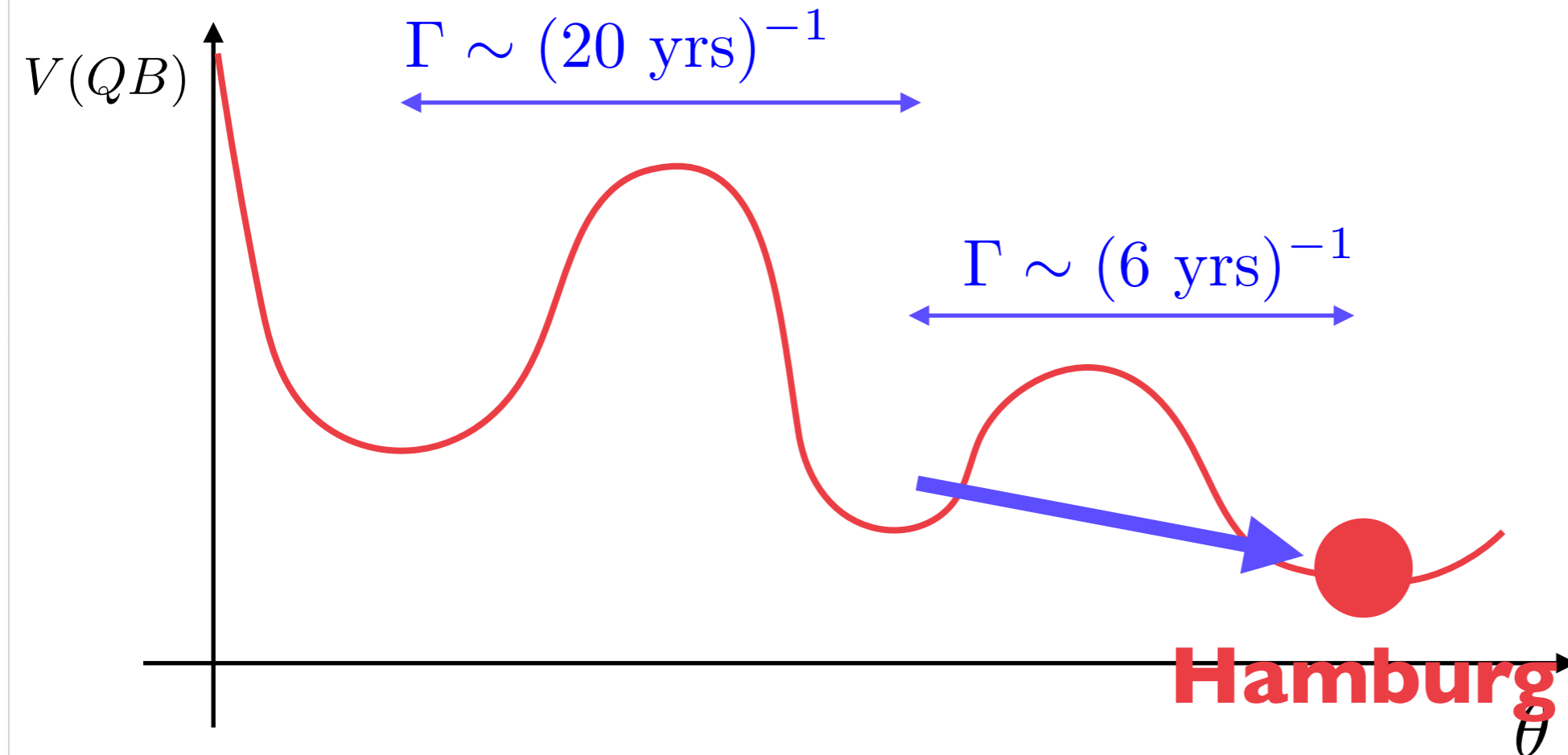
My phase transitions



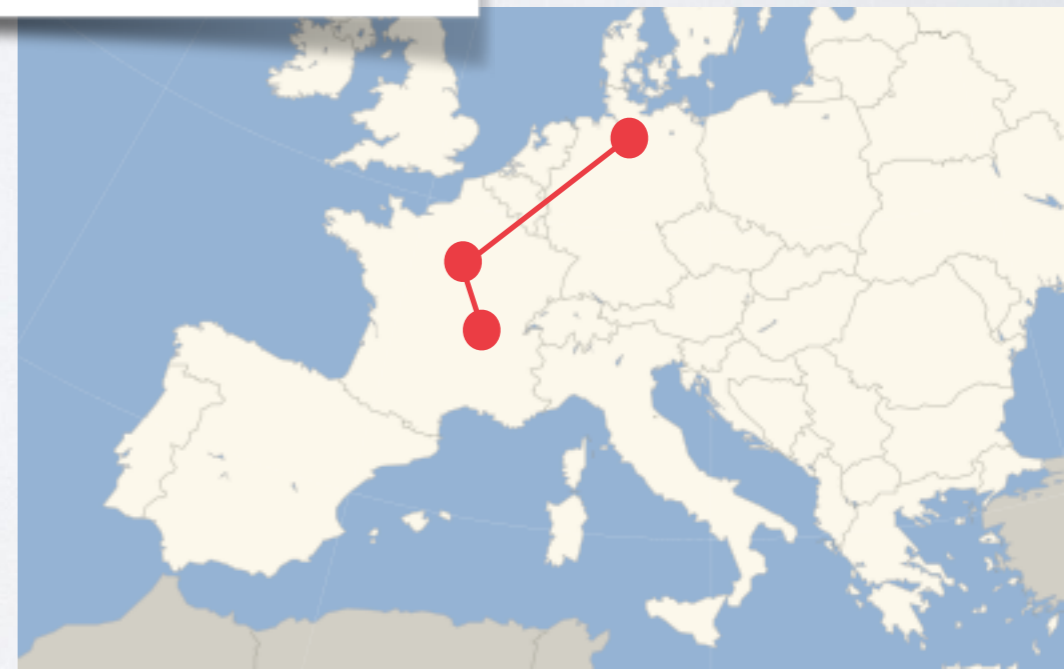
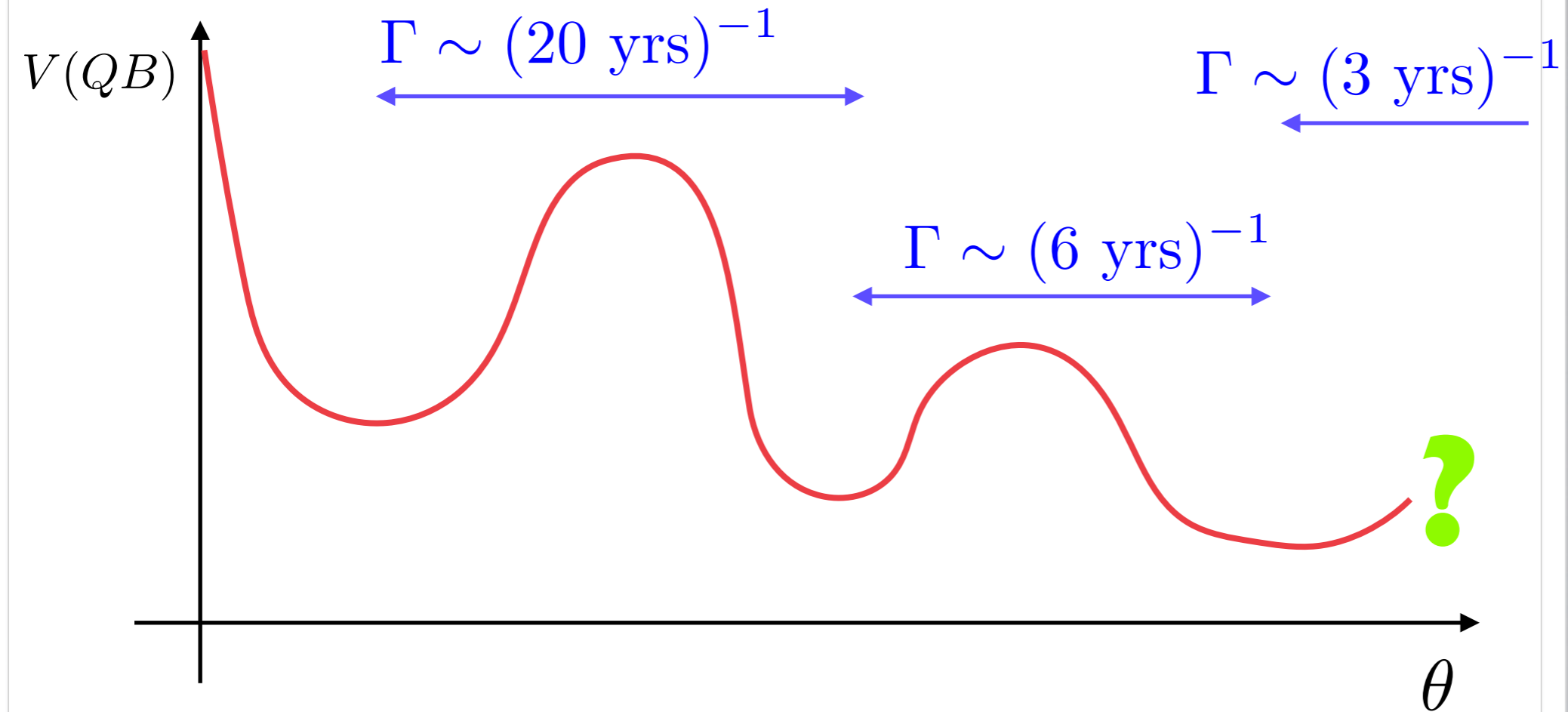
My phase transitions



My phase transitions



My phase transitions



Bottles in the sea

Bottles in the sea



Bottles in







Bottles in the sea

Bottles in the sea



Bottles in the sea









imperfecto del subjuntivo, really??

我是法国人

Wǒ shì fàguó rén

Wò shì fàguó rén

Wo shì fàguó rén

... 4^5 choices

working on it...



Axions, SUSY (breaking) and swampland conjectures

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Goal : explain PQ symmetries as accidental symmetries

Axions, SUSY (breaking) and swampland conjectures

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Goal : explain PQ symmetries as accidental symmetries
Why : SM structure, swampland

Axions, SUSY (breaking) and swampland conjectures

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Goal : explain PQ symmetries as accidental symmetries

Why : SM structure, swampland

How : with additional gauge symmetries

Axions, SUSY (breaking) and swampland conjectures

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Goal : explain PQ symmetries as accidental symmetries

Why : SM structure, swampland

How : with additional gauge symmetries, and with care

$$\frac{\phi^5}{M_P} \rightarrow \frac{\phi^{a \text{ lot}}}{M_P^{a \text{ lot} - 4}}$$

Axions, SUSY (breaking) and swampland conjectures

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Goal : explain PQ symmetries as accidental symmetries

Why : SM structure, swampland

How : with additional gauge symmetries, and with care

In addition to : Generating hierarchical effective scales and a very efficient protection with the clockwork mechanism
Constraints for a QCD axion, good fuzzy DM

Axions, SUSY (breaking) and swampland conjectures

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Goal : explain PQ symmetries as accidental symmetries

Why : SM structure, swampland

How : with additional gauge symmetries, and with care

Studying the interplay of the PQ solution and SUSY

In addition to : breaking in a Green-Schwarz-inspired setup

Too heavy in naive models, possible to refine

Axions, SUSY (breaking) and swampland conjectures

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Goal : explain PQ symmetries as accidental symmetries

Why : SM structure, swampland

How : with additional gauge symmetries, and with care

In addition to :
Explaining the mass hierarchies via a gauged FN mechanism
New (holomorphic) UV complete gauged models, with an accidental axion

Axions, SUSY (breaking) and swampland conjectures

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Goal : find classical solutions in scalar theories to study (some) multiparticle amplitudes, and domain walls via dualities

Outcome : an exact classical BPS solution of the WZ model

Axions, SUSY (breaking) and swampland conjectures

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Goals : - UV models with low SUSY breaking scales
- non-linear SUSY and SUGRA for inflation, particle pheno
and formal aspects of broken SUSY in extended SUSY theories

Axions, SUSY (breaking) and swampland conjectures

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Goal : tests of the WGC in (perturbative) superstring setups with broken SUSY

Outcome : satisfied in non-trivial way, quantum effects to work out

Axions, SUSY (breaking) and swampland conjectures

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For the near future : EFTs for axion physics, either bottom-up (ex: IR consistency) or top-down (ex: calculations of EFT coefficients), more work on the swampland conjectures (from perturbative strings, or related to the deeper studies of the conjectures themselves)

Thanks !