Gravitating Around Gravity

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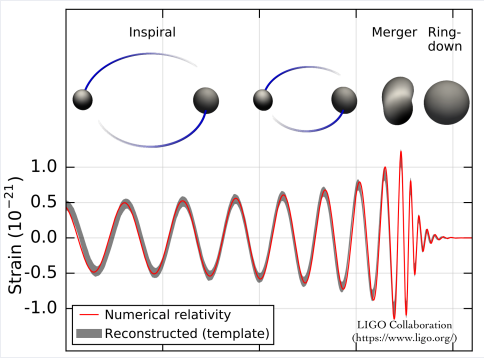
A very brief CV : Academic Background

- 2000 : PhD in mathematical physics $\longrightarrow$ Low Dimensional Gravity
- 2003 : Post-Doc at Penn State University $\longrightarrow$ Quantum Gravity
- 2004 : Associate Professor at Tours University $\longrightarrow$ Modified Gravity

- 2021 : Professor at IJCLab, Paris-Saclay University $\longrightarrow$ Still Gravity : GW ?

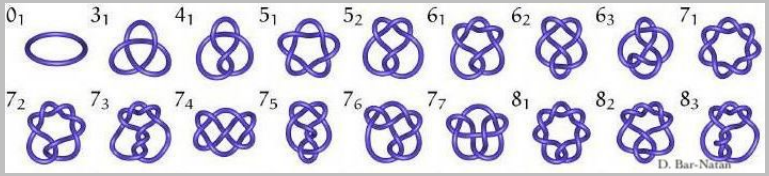
What I'd like to do? Towards the Physics of Gravitational Waves...

- The era of Gravitational Waves $\Longrightarrow$ Testing Gravitation in Strong Field Regime



- One might expect new physics and deviations from General Relativity
- Discover alternative theories or modified gravity and study their phenomenology

A short story on knot invariants

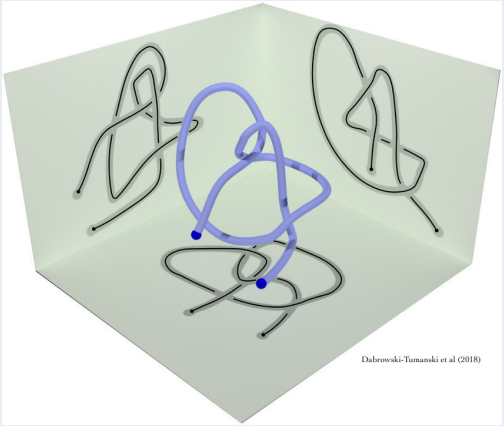


- For a long time, mathematicians (and physicists) tried to classify knots
- In the 80's, very important progresses with knot polynomials :

$$K \longrightarrow P_K(q) = \sum_{n\in\mathbb{Z}} c_n q^n$$

- Computation of $P_K(q)$ based on projecting the knot and applying some rules

A problem on knot invariants (by M. Atiyah)



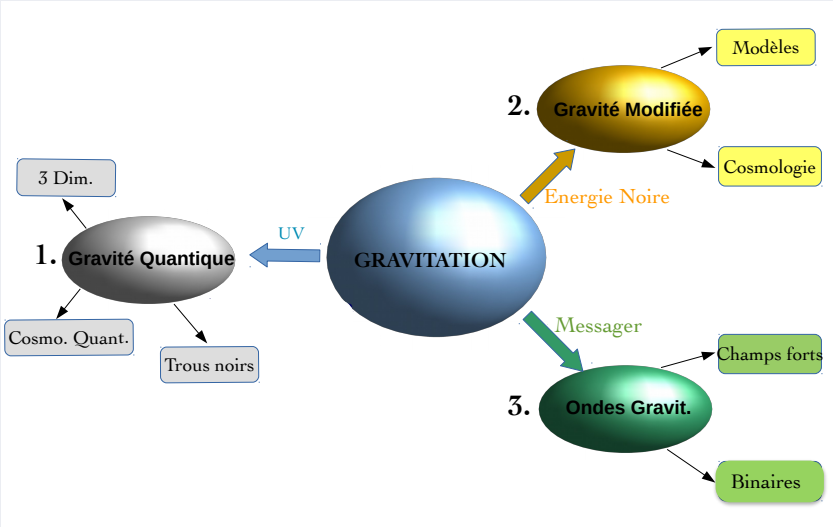
- Is there a 3 dimensional way to understand these invariants (knots have a 3D structure) ?

Knots and Gravitation : a fascinating and deep relationship by Witten

Very formally (without going into details)

$$P_K(q) \quad \text{is related to} \quad \int [\mathcal{D}g_{\mu\nu}] W_K(g_{\mu\nu}) \exp\left[\frac{i}{\hbar} S_{EH}(g_{\mu\nu})\right]$$

- Gravitation (in 3D) appears in mathematical theory of knot invariants
- Extremely important result for quantum gravity
- It has been one of my topic of research in the begining...


Modèles
2. Gravité Modifiée
Cosmologie
Energie Noire
3 Dim.
UV
1. Gravité Quantique
GRAVITATION
Cosmo. Quant.
Trous noirs
Messager
Champs forts
3. Ondes Gravit.
Binaires