

? INTER-ROGATIONS ÉTRANG(ÈR)ES ?*Série de Dia-logues de Re-cherche***Sous la direction de François Soulages****Tous les 3^{èmes} mercredis du mois, de 19 h à 20 h 30, en distanciel**

Quelles inter-rogations principales travaillent les chercheurs qui, en retour et dialectiquement, les travaillent ?

Non pas quelles sont leurs thèses, ni quelles sont leurs hypo-thèses, mais qu'est-ce qui les embarrasse, les contrarie, les paralyse, leur fait problème, les plonge dans la stupeur, la contradiction, le silence, l'arrêt ?

« Je ne cherche pas à connaître les réponses, je cherche à comprendre les questions. » disait Confucius ; deux millénaires et demi après, écoutons ces inter-rogations étranges et étrangères. *Étranges*, car il est plus facile et plus inutile d'affirmer que d'(e s)'interroger. *Étrangères*, car nous n'écouterons et ne dia-loguerons qu'avec des personnes étrangères pour mieux nous enrichir de leurs différences, pour dé-payer nos certitudes, pour dé-couvrir des paysages radicalement nouveaux, pour nous demander s'il y a des affaires étrangères, et, si oui, lesquelles.

Ces personnes avec qui nous dia-loguerons (s')inter-rogent (dans) tous les domaines – philosophies, sciences (humaines), littératures, arts...

La rencontre se fera en 3 temps : 1^{ère} demi-heure, présentation de son inter-rogation par la personne elle-même ; 2^{ème} demi-heure, dia-logue entre elle et moi-même ; 3^{ème} demi-heure, dia-logue entre elle et les personnes qui assistent au Dia-logue de Re-cherche. Dia-logue entre des personnes et non confrontation entre des communicants, essai d'inter-humanité.

François Soulages, *Arada*, 41, 2022**2^{ème} ? INTER-ROGATIONS ÉTRANG(ÈR)ES ?****Mercredi 10 décembre 2025, 19 h (heure de Paris)****En distanciel :** <https://univ-paris8.zoom.us/j/91241827337?pwd=or28wsFbk4hLXB40tzoKOfB2J8dWka.1>

ID de réunion: 912 4182 7337 & Code secret: 452028

LE QUANTIQUE ?**Norma Graciela Sanchez**

Physicienne franco-argentine en physique théorique, gravitation, cosmologie, théorie quantique.

Directrice de recherche émérite au Centre national de la recherche scientifique CNRS, Institut National des Sciences de l'Univers INSU, à l'Observatoire de Paris-Université Paris Sciences et Lettres et Sorbonne Université.

Fondatrice et directrice de l'École internationale Chalonge – de Vega, inaugurée à l'automne 1991 par le physicien Nobel

Subrahmanyan Chandrasekhar, et qui compte plusieurs prix Nobels de Physique parmi ses membres.

Nominée au Prix Nobel de Physique depuis 2019.

1/ 28 11 25 GRÈCE Démosthène Agrafiotis, **L'IRREMPLAÇABLE ?**2/ 10 12 25 ARGENTINE Norma Graciela Sanchez, **LE QUANTIQUE ?**3/ 21 1 25 BRÉSIL Bruno Zorzal, **L'ARCHIVE QUI MANQUE ?**4/ 18 2 25 HONGRIE Aniko Adam, **LA TRANSDISCIPLINARITÉ ?**5/ 18 3 25 BRÉSIL Leon Fabri Neto, **SPINOZA ?**6/ 15 4 25 CHINE Hui Zhang, **L'INTERCULTURALITÉ ?**7/ 13 5 25 GRÈCE Panayotis Papadimitropoulos, **LA PHOTOGRAPHIE AUJOURD'HUI ?**8/ 10 6 25 ESPAGNE Pilar Garcia Abril, **CRÉER ?**



LE QUANTIQUE



Inter-rogations

dans le Séminaire Soulages - Paris-

RETIINA INTERNATIONAL

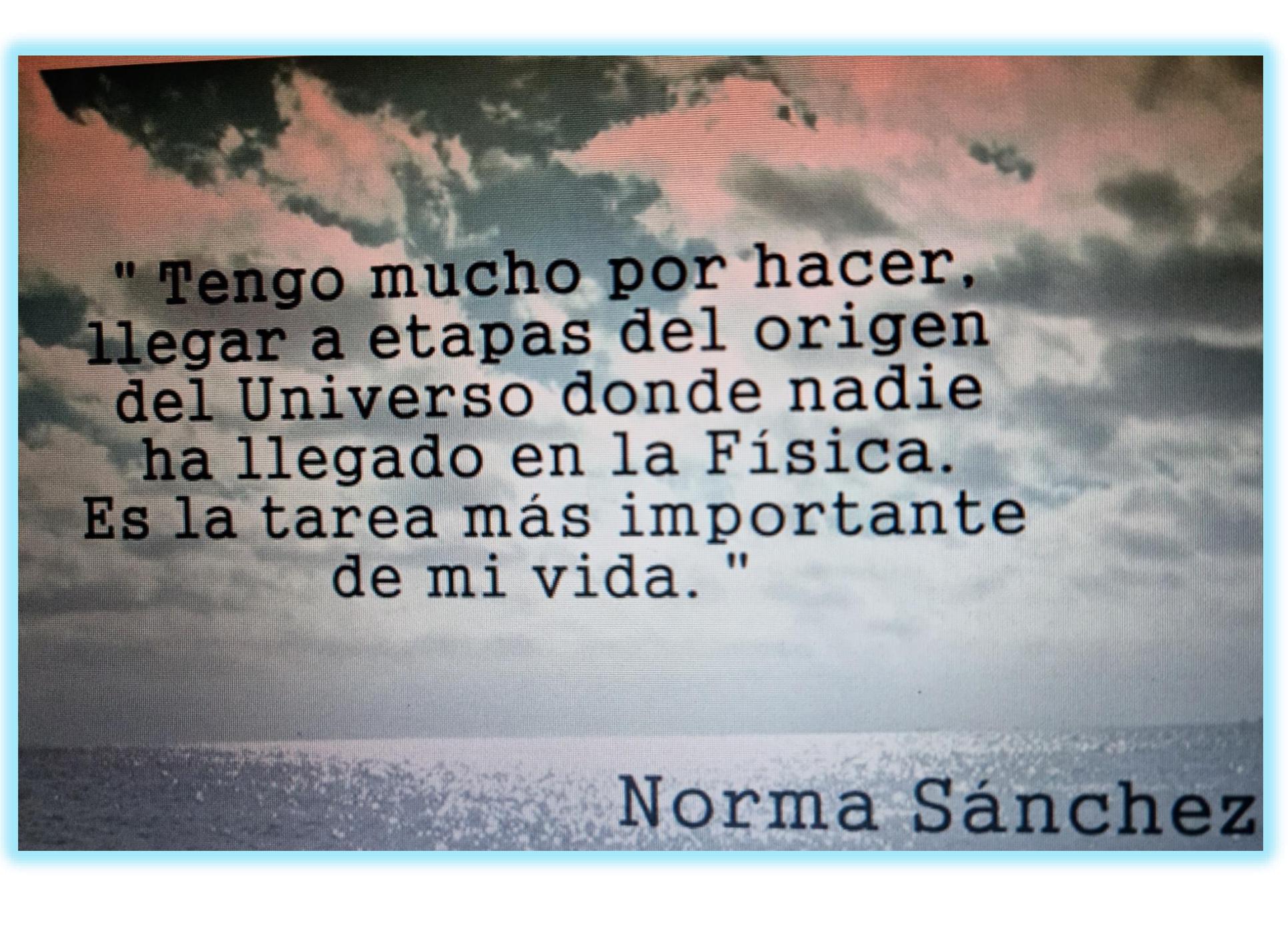
**Prof Dra Norma G. SANCHEZ, CNRS Paris
Chalonge – de Vega International School &
Institute**

10 décembre 2025

Un mot sur le Langage

Los desarrollos científicos incorporan nuevos conceptos y lenguaje, o asignan nuevos contenidos a las palabras existentes. Lo que se percibe en un momento dado como "difícil" o no habitual, se convierte posteriormente en "estándar" y se incorpora al pensamiento "habitual" mediante el uso corriente o repetido de estas palabras en las comunicaciones actualesmismo si no los entendamos totalmente...

Les développements scientifiques incorporent des nouveaux concepts et langage, ou attribuent des nouveaux contenus à des mots existants . Ce qui est perçu à un moment donné comme "difficile" ou non habituel, devient par la suite "standard" et incorporé à la pensée "habituel" par l'usage de ces mots dans les communications courantes....meme si nous les comprenons pas, totalement....



" Tengo mucho por hacer,
llegar a etapas del origen
del Universo donde nadie
ha llegado en la Física.
Es la tarea más importante
de mi vida. "

Norma Sánchez

re image du trou noir : l'univers se dévoile

de la Terre.
 photos ont eu lieu en
 quand huit télescopes
 aux trous noirs : Sigh-
 centre de notre voie
 congélateur de la ga-
 dont la photo a été

ite ? Huit mois de
 m de ce type d'explé-
 rations, les observa-
 tions, les astro-
 nautiques moyen de sa-
 a fonctionné. Il aura
 être de déboucher un
 man à travers les téles-
 copes, dans l'Univers,
 le dans une boîte de

en de travail a été
 pour remonter les
 photos. « Pour plus de
 travail a été fait quatre
 autre équipes différen-
 tes Frédéric Gueth,
 deux des études.

aren du « Seigneur
 »
 ge du trou noir, depuis
 pas recherché, si son
 idéal - et aussi lentement
 l'objet de six articles
 accord dans la revue
 Journal Letters. Et
 avant la même image,
 même sur un halo noir
 du trou noir sur le
 maître qui l'entoure.

révélation, cette pho-
 tographie parler. Beau-
 coup d'années à l'am-
 asser. à ce trou noir avec l'au-
 tre du « Seigneur des
 Ringes Sauron.
 50 millions d'années-
 lumière continue de
 par...

T. L. (avec AFP)

angeté

armes, ce que vous
 pas forcément où
 est. Un objet peut ap-
 paraître ou disparaître,
 disparaître ou réapparaître,
 disparaître ou réapparaître
 d'un astronaute qui
 vers l'horizon d'un
 serait transformé en
 des pieds accélérant
 en un lieu. Et c'est sans
 temps qui se dilate, et
 qui se dilate vers le
 à devenir invisible.
 leur lentement qui
 re-chasse de ce même
 aussi l'impression
 sentir accélérer plus
 de s'échapper progres-

J.-M.L.



Le trou noir photographié est celui situé au centre de la galaxie M87, à environ 50 millions d'années-lumière de la Terre. Photo EUROPEAN SOUTHERN OBSERVATORY/ESA

REPÈRES

Une existence théorique
 Dès la fin du XVIII^e siècle, l'astronome anglais John Michell et le marquis de Laplace avaient eu l'intuition de l'existence des trous noirs. Mais il nous faudrait attendre le début du XX^e siècle et la théorie de la relativité générale d'Einstein pour que les trous noirs rejoignent le domaine cosmologique. Le chemin de la reconnaissance a toutefois été long. Einstein lui-même n'y croyait pas. C'est à un autre astrophysicien allemand, Karl Schwarzschild qu'on doit la démonstration de leur existence. Le terme de « trou noir » n'est toutefois apparu que tardivement, au milieu des années 1960. Pour autant, sans d'observation directe, leur existence restait jusqu'à présent purement théorique.

Des preuves indirectes
 Depuis une trentaine d'années, les progrès technologiques ont permis de multiples observations de trous noirs. Mais toujours indirectes. Heureusement, dans l'univers, beaucoup de trous noirs sont aussi discrets qu'un éléphant dans un magasin de porcelaine. Lorsqu'ils « avalent » une étoile voisine, d'immenses jets de matière peuvent se produire. Les plus gros sont armés de disques d'accrétion tournant à des vitesses vertigineuses, et d'où s'échappent lentement de gigantesques jets de radiations. Leur présence peut également être trahie par l'effet de lentille gravitationnelle, qui peut déformer ou déformer l'image d'un objet lointain. Et ne mentionnons même pas le cas de la collision de deux trous noirs : c'est un événement de ce type qui a permis de détecter pour la première fois les ondes gravitationnelles en 2015.

PHOTO: V.

QUESTIONS À

Norma G. Sanchez Physicienne théoricienne, directrice de recherche au CNRS et directrice de l'École internationale d'astrophysique Daniel Chalonge

Le prochain défi est d'aller voir à l'intérieur

La première image du trou noir vient d'être dévoilée. Quelles sont vos impressions ? Il y a l'exploit scientifique d'avoir assemblé cette image, de reconstituer ce puzzle grâce aux huit télescopes du réseau Event Horizon Telescope. Après, sur l'image en elle-même, à savoir un puits noir entouré de matière qui émet de la lumière, cela n'est pas surprenant. Cette image était pressentie, mais elle reste importante aussi bien pour l'observation de la galaxie que pour la physique théorique.



Photo DR

Quelle est la prochaine étape ?
 Depuis Stephen Hawking, on sait que les trous noirs rayonnent, et donc émettent des informations. Désormais, le prochain défi est d'aller voir à l'intérieur d'un trou noir en allant capter ces informations. La première étape sera d'intégrer les nouvelles connaissances scientifiques. Jusqu'à présent, toutes les observations de trous noirs, y compris cette photographie, sont basées sur la théorie d'Albert Einstein sur la relativité générale qui date de 1915 ! Pour comprendre ce que contient un trou noir, il va falloir aller au-delà d'Einstein, et ce, même si sa théorie a été magnifique pour la communauté scientifique, même au siècle plus tard. Nous avons fait des progrès, heureusement !

Pouvez-vous attendre à des surprises ?
 Je ne pense pas. Ce qui paraissait étrange pour Einstein ou même Hawking devient plus simple au fur et à mesure des nouvelles connaissances. D'où l'intérêt de les intégrer.
 Recueilli par Thibault LIESSI

6,5

MILLIARDS de fois la masse du Soleil, telle est le poids du trou noir dont la photo a été observée ce mercredi. Pour quantifier, la masse du Soleil équivaut à 333 000 fois la masse de la Terre. Notre planète pèse environ 6 000 quadrillions de kilogrammes. En masse, un quadrillion, c'est au-delà de mille milliards de milliards de kg.

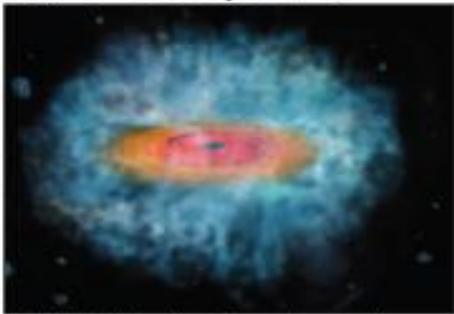
PHOTO: V.

Un trou noir, c'est quoi ?

Pour comprendre ce qu'est un trou noir, imaginez que vous devez envoyer une lettre dans l'espace. Pour y parvenir, il vous faut évidemment atteindre une certaine vitesse. C'est ce qu'on appelle la vitesse de libération, qui permet de s'échapper du champ gravitationnel.

Pour la Terre, cette vitesse est de 11,2 km/s. Vous savez désormais pourquoi les fusées ont de gros moteurs. Si vous décidez d'un corps plus léger, évidemment, pas besoin d'aller aussi vite : les astronautes d'Apollo 11 n'ont eu besoin que d'atteindre 2,4 km/s pour quitter la Lune.

Et si vous voulez à la surface d'un corps plus lourd ? C'est logique, la vitesse de libération augmente. Sur Neptune, elle s'élève à 23,5 km/s, sur Jupiter 59,5 km/s... Mais il y a une limite : la vitesse de la lumière. Que se passe-t-il lorsque le corps est tellement lourd, qu'il faudrait attein-



Vue d'artiste de la formation d'un trou noir supermassif. NASA/CXC/M. Weiss

dre les 300 000 km/s pour échapper à son attraction ? Eh bien, rien. Rien, car rien ne peut atteindre une telle vitesse, pas même un photon. Si un corps est tellement massif que la vitesse de libé-

Des nains et des géants
 Contrairement à une idée reçue, tous n'ont toutefois pas une densité gigantesque. Ce n'est le cas que pour les trous noirs stellaires, nés de l'effondrement d'une étoile, et dont le diamètre peut être ridiculement petit. Dans ce dernier, une masse équivalente à celle de la Terre tiendrait dans le volume d'une noix.
 D'autres trous noirs auraient une densité proche de celle de l'eau, mais compensent par une taille gigantesque : certains de ces géants pourraient faire plusieurs fois la taille de notre système solaire. Ce sont ces trous noirs dits « supermassifs » qui se trouveraient au centre des galaxies, à l'image de Sagittarius A*. Ils sont même susceptibles d'être les véritables architectes de l'Univers, à l'origine de la création des étoiles et des galaxies.
 Jean-Michel LAHIRE

CONTENU

UNA NUEVA FISICA CUANTICA Y DE UNIFICACION

FISICA TRANSPLANCKIANA

UN NUEVO MUNDO CUANTICO:

CONO DE LUZ CUANTICO. INTERIOR DE AGUJEROS NEGROS. RAIZ
CUANTICA DEL UNIVERSO, ...

NUEVO 2023-2024

UN NUEVO DESCUBRIMIENTO Y FORMULACION

CON JOSE LUIS MAC LOUGHLIN

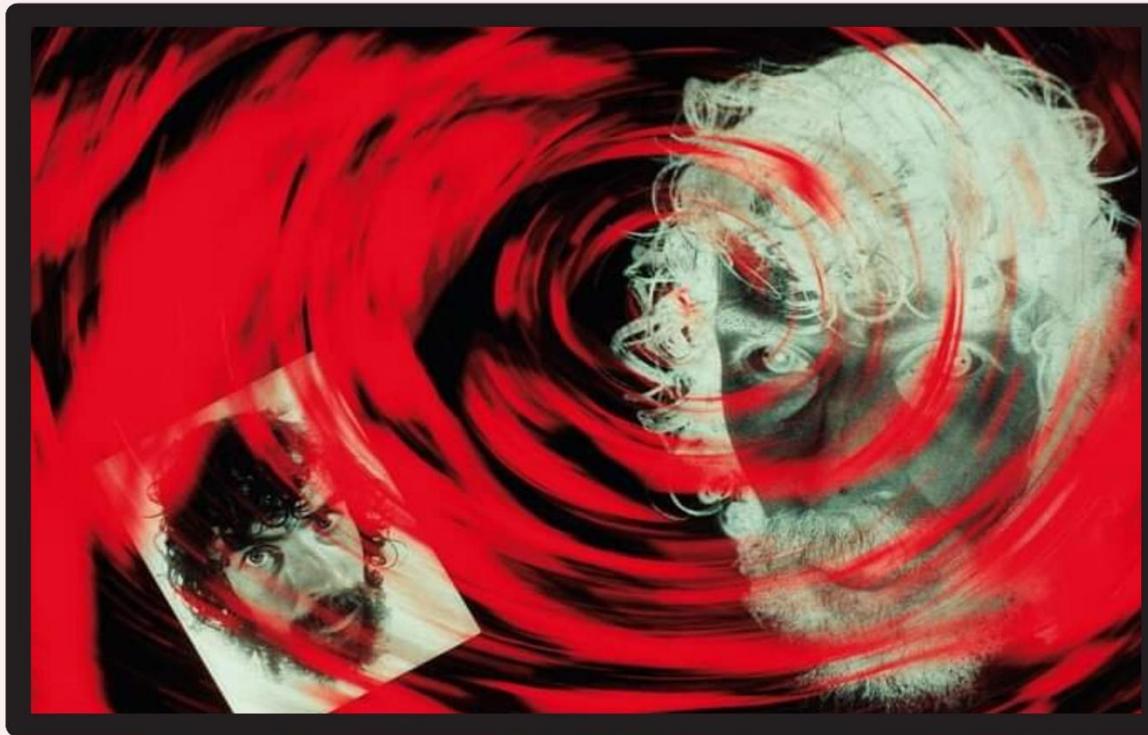
NUEVOS SISTEMAS CUANTICOS DE INFORMACION:

QFOTOGRAFIA, FOTOQUBITS, QCINEMA,

QCEREBRO, QCOMPUTACION CUANTICA, QIA, QLENGUAJE, ...



LA NUEVA FOTOGRAFIA CUANTICA



MARDI 19 NOVEMBRE À 18H

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JOSE LUIS MAC LOUGHLIN, NORMA G. SANCHEZ

NUEVOS SISTEMAS CUANTICOS DE INFORMACION:

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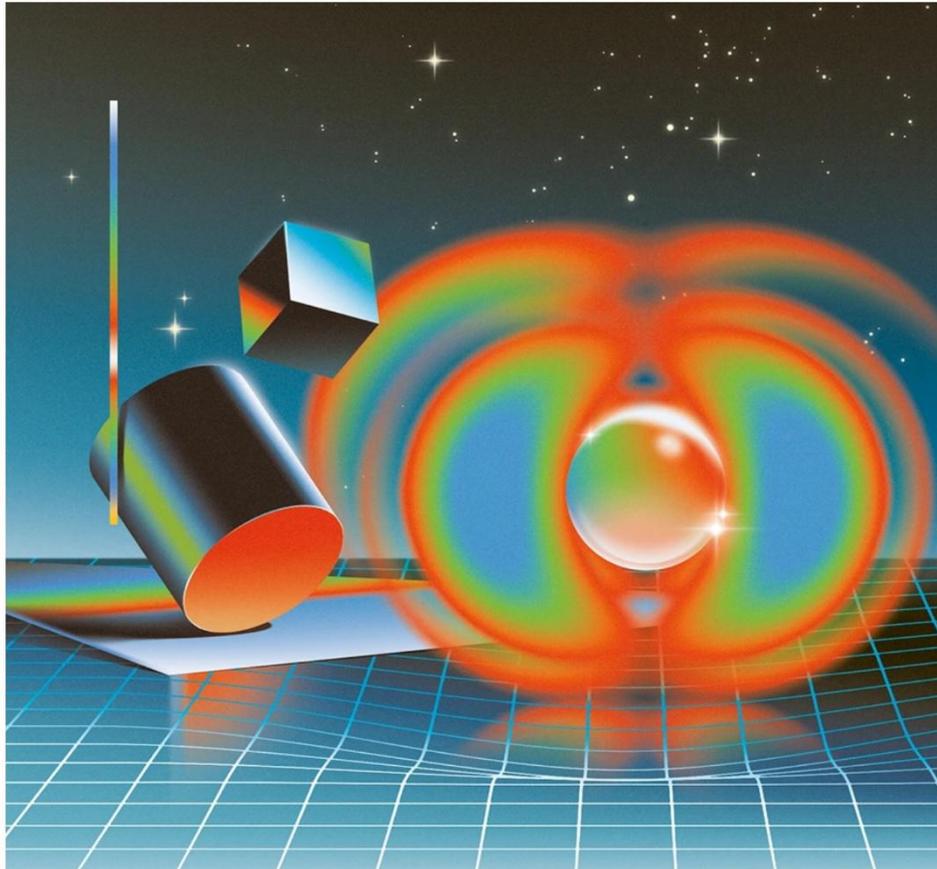
**Q CEREBRO, Q COMPUTACION CUANTICA, Q IA,
Q LENGUAJE, ...**

ESSAY | 26 August 2025

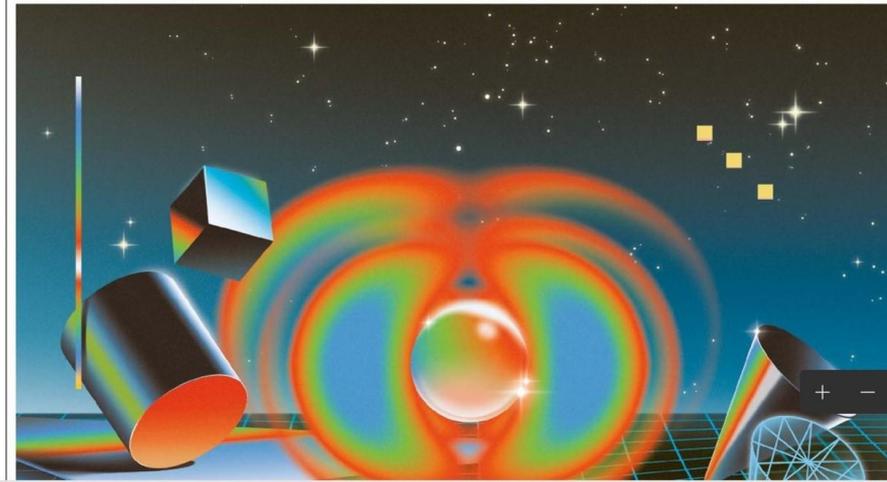
Einstein hated entanglement – and five other quantum myths

There's nothing intuitive about quantum theory – six physicists debunk some of the most common misconceptions.

By [Maria Violaris](#) ✉, [Estelle Inack](#) ✉, [Sabine Hossenfelder](#), [Norma G. Sanchez](#) ✉, [Shweta Agrawal](#) ✉ & [Emily Adlam](#) ✉



Books & arts



Six quantum myths to wrap your head around

There's nothing intuitive about quantum theory – physicists debunk some of the most common misconceptions.

Books & arts

NORMA SANCHEZ IS GENERAL RELATIVITY IRRECONCILABLE WITH QUANTUM PHYSICS?

Physicists have devised two grand theories to understand reality. The general theory of relativity dominates how things happen at large scales, such as across the cosmos. Quantum mechanics, meanwhile, covers atom-sized forces or smaller. Many physicists quibble that they might never be reconciled – although we have no real indication that it is not possible. In the past few years, progress and the potential for new observations, such as those of gravitational waves, gives me hope that we won't need a completely new theory to encompass both.

In their current form, these theories produce pictures that are completely at odds with each other, impractical or unintelligible. Gravity, for example, is well explained by the general theory of relativity as a curvature of space-time in the presence of massive bodies.



Nature is Quantum

That means that the real and complete laws of nature are **those of quantum physics**. **Classical behaviours and domains** are particular cases, limiting situations or approximations.

Classical gravity, and thus successful General Relativity are incomplete (non quantum) theories and must be considered as a particular approximation from **a more quantum complete theory**.

UN NOUVEAU MONDE QUANTIQUE

Comienza a partir de la Escala de Planck

$$m_p = (hc/G)^{1/2}$$

10^{-5} gr, 10^{-33} cm, 10^{-44} sec, 10^{19} GeV

***Hacia el Dominio de la Fisica
Trans-Planckiana***

A complete Quantum Theory should include and account for the Physics at the Planck scale and the domain beyond it.

(i) Instead of starting from Gravity, that is General Relativity and quantize it (by applying the different quantization procedures, with the by now well known problems and its rich bibliography),

(ii) I started from Quantum theory and try to extend it to the Planck scale domain. (instead of going from classical gravity to quantum gravity, I go from quantum physics to quantum gravity).

Of course, in constructing the road (ii) many of the lessons from road (i) are most useful.

The Wave-Particle Duality of Quantum Physics Including Gravity

Nature has a dual behavior of wave and corpuscle:
this is the well known
classical-quantum duality or wave-particle duality

of quantum physics (as the light and its photons, the microscopic world of elementary particles, ultradense plasmas, the laser, macroscopic quantum states (as compact stars, dwarfs, black holes), and many other examples).

I generalized this duality to gravity

by including its three regimes: classical, semiclassical and quantum, together with the Planck regime and the elementary particles domain: namely the

wave-particle-gravity duality* or the *classical-quantum gravity duality.

NGS, IJMPD18, IJMP19, GraCosm2019, PhyRevD Dec 2021

This Duality is Universal

it includes the known duality and allows a general clarification and new results which reveal:

(i) The classical-quantum duality of the space-time and black holes

(ii) A new quantum domain not present in classical gravity does appear

(iii) The quantum light-cone from which the known classical light-cone of relativity and the classical universe are a special case.

A more complete vision of space-time does

THE FUNDAMENTAL PLANCK SCALE

$$(\mathbf{h}, \mathbf{c}, \mathbf{G}): \quad \mathbf{L}_G = 2\mathbf{GM}/\mathbf{c}^2, \quad \mathbf{L}_Q = \mathbf{h}/\mathbf{Mc}$$

$$\mathbf{l}_P = (\mathbf{hG}/\mathbf{c}^3)^{1/2}, \quad \mathbf{m}_P = (\mathbf{hc}/\mathbf{G})^{1/2}$$

$$\mathbf{G}/\mathbf{c}^2 = \mathbf{l}_P/\mathbf{m}_P, \quad \mathbf{l}_P \mathbf{m}_P = \mathbf{h}/\mathbf{c}$$

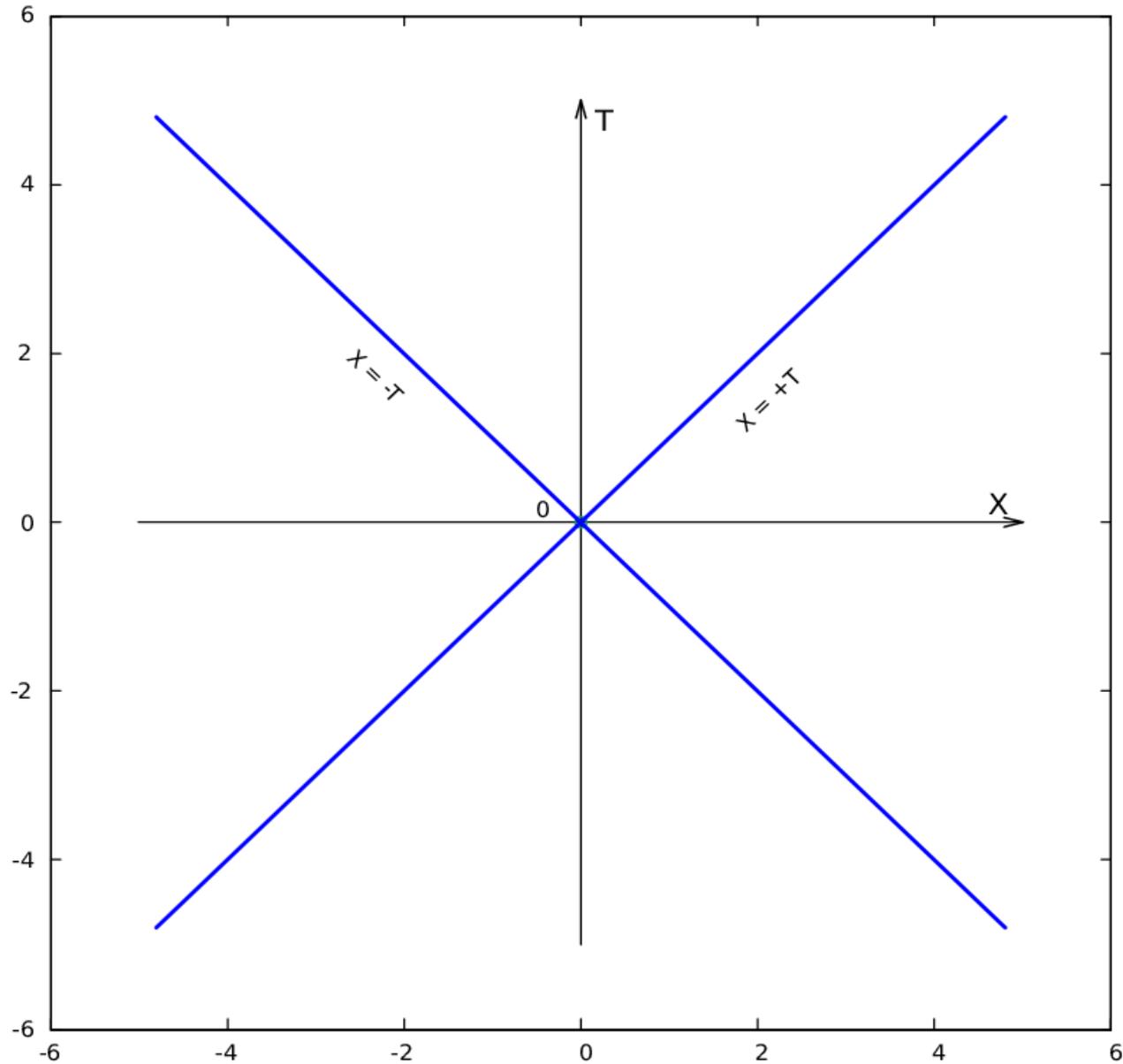
$$\mathbf{l}_P = 10^{-33} \text{ cm}, \quad \mathbf{m}_P = 10^{-5} \text{ gr}, \quad \mathbf{t}_P = 10^{-44} \text{ sec}$$

$$\mathbf{L}_Q = \mathbf{l}_P^2 / \mathbf{L}_G, \quad \mathbf{M}_Q = \mathbf{m}_P^2 / \mathbf{M}, \quad \mathbf{O}_Q = \mathbf{o}_P^2 / \mathbf{O}_G$$

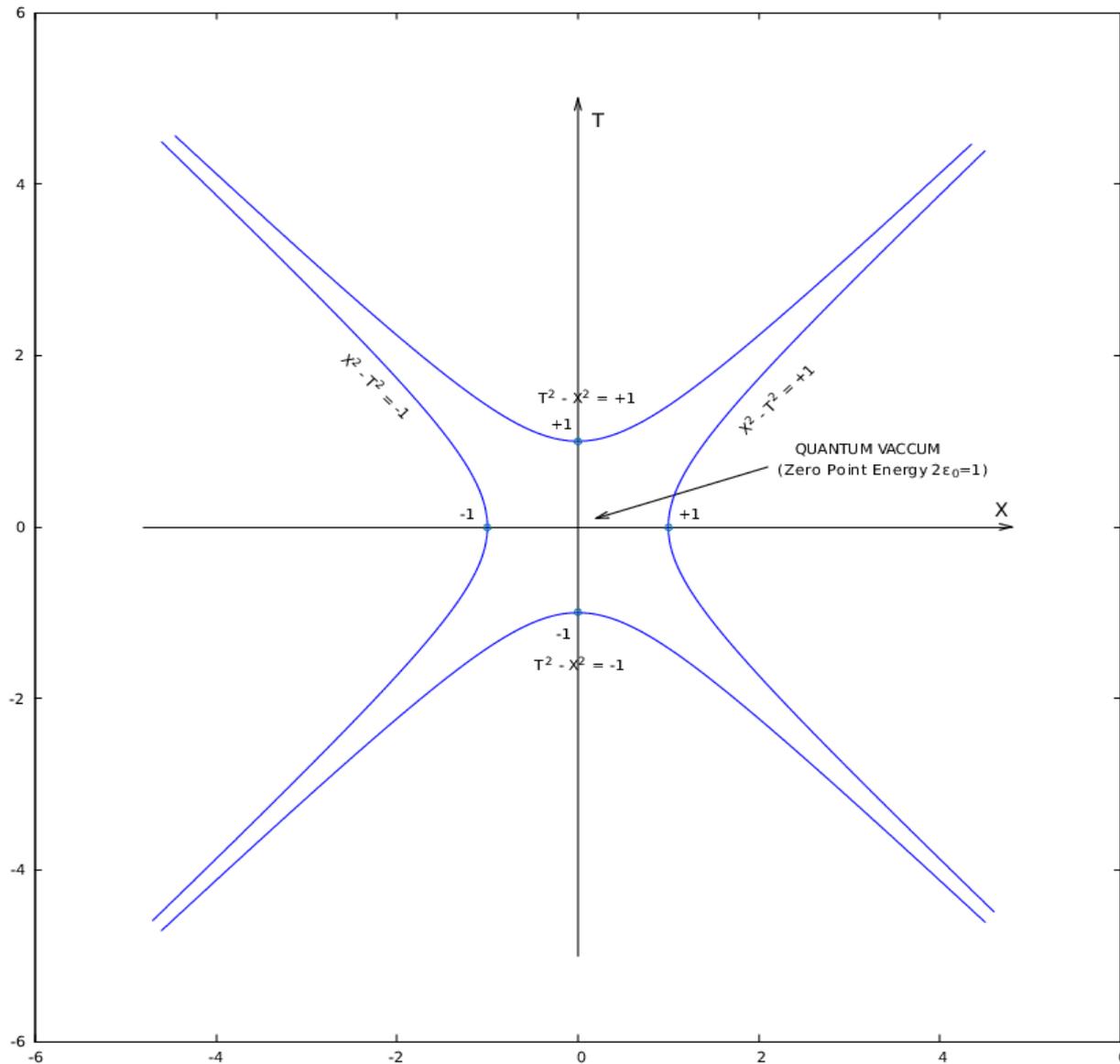
$$\text{New Variables : } \mathbf{L}_{QG} = \mathbf{L}_Q + \mathbf{L}_G, \quad \mathbf{O}_{QG} = \mathbf{O}_Q + \mathbf{O}_G, \quad \mathbf{Q} \leftrightarrow \mathbf{G}$$

$$\text{N.G.S, Int J. Mod Phys D18, 1950055 (2019)} \quad \mathbf{O}_{QG} = \mathbf{o}_P (\mathbf{O}_G/\mathbf{o}_P + \mathbf{o}_P/\mathbf{O}_G)$$

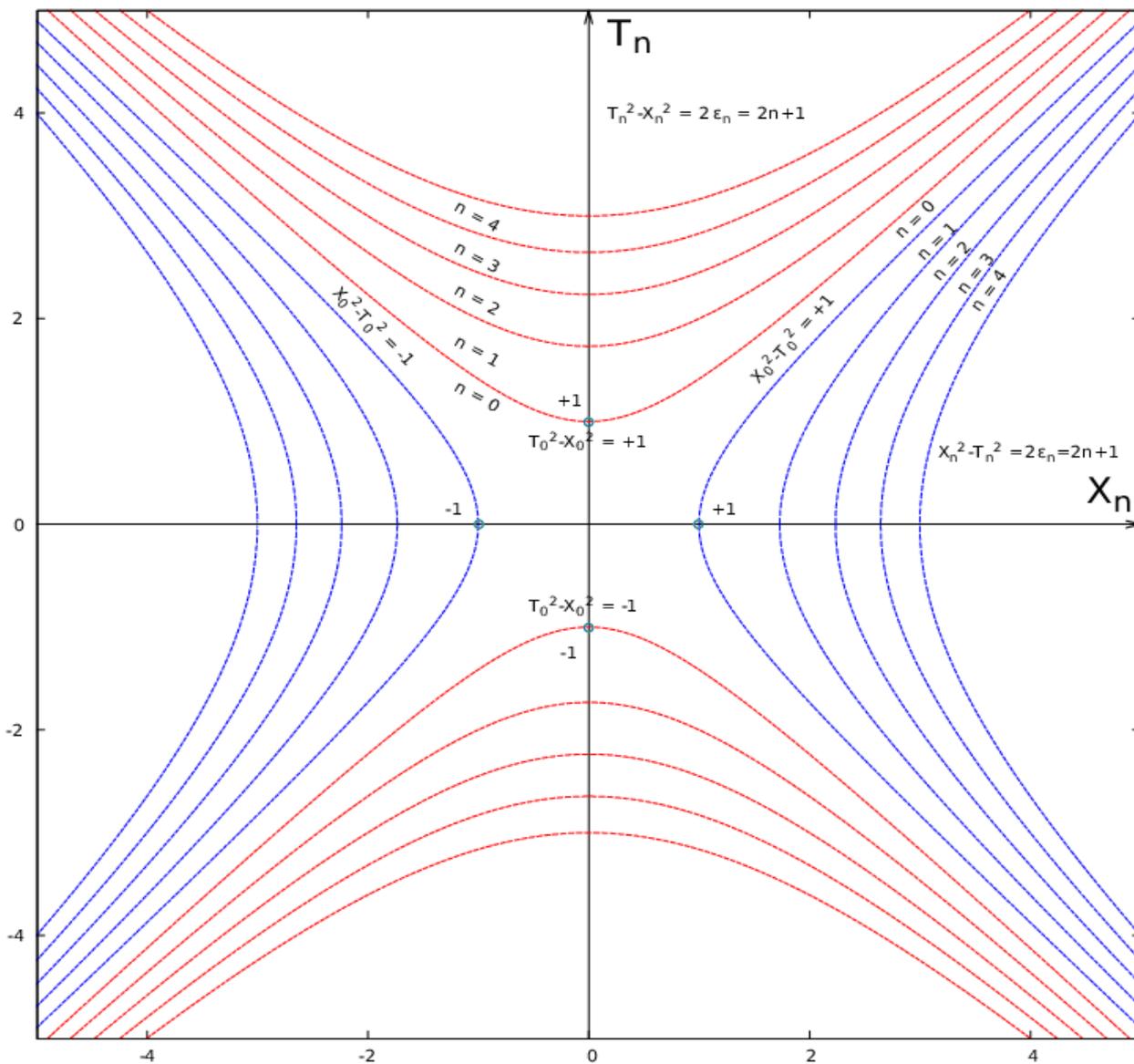
THE CLASSICAL LIGHT CONE



THE QUANTUM LIGHT CONE



QUANTUM SPACE-TIME STRUCTURE



NEW QUANTUM STRUCTURE OF THE SPACE-TIME

- THE CLASSICAL - QUANTUM DUALITY OF NATURE :

- $O_G = o_P^2 / O_Q$, $L_G = l_P^2 / L_Q$, $L_G = 2GM / c^2$, $L_Q = h / Mc$

- THE SPACE TIME (X, T) Coordinates as

- QUANTUM NON COMMUTING OPERATORS : $[X, T] = 1$

- THE SPACE-TIME AS a QUANTUM HARMONIC OSCILLATOR:

$$[X, P] = i, \quad 2H = X^2 + P^2 = 2n + 1, \quad [2H, X] = -iP, \quad [2H, P] = iX$$

$$P = iT :$$

$$[X, T] = 1, \quad 2H = X^2 - T^2 = 2n + 1, \quad [2H, X] = T, \quad [2H, T] = X$$

QUANTUM SPACE-TIME

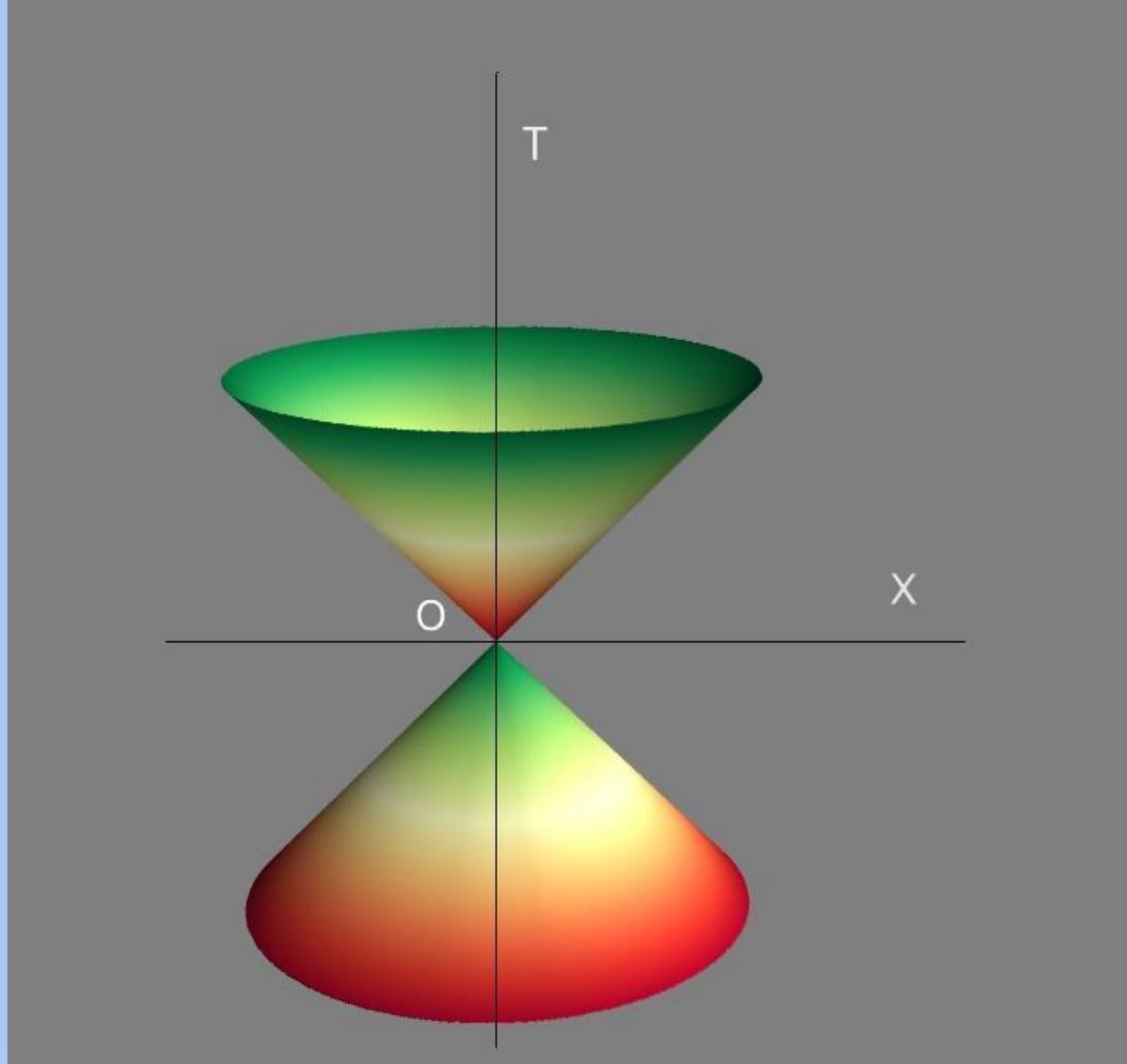
- $(T^2 - X^2) - 1 \geq 0$: *timelike*
- $(X^2 - T^2) - 1 \geq 0$: *spacelike*
- $(T^2 - X^2) - 1 = 0$, *null* : the "quantum light- cone".

$$(X^2 - T^2)_n = 2n + 1 : \text{discrete levels}$$

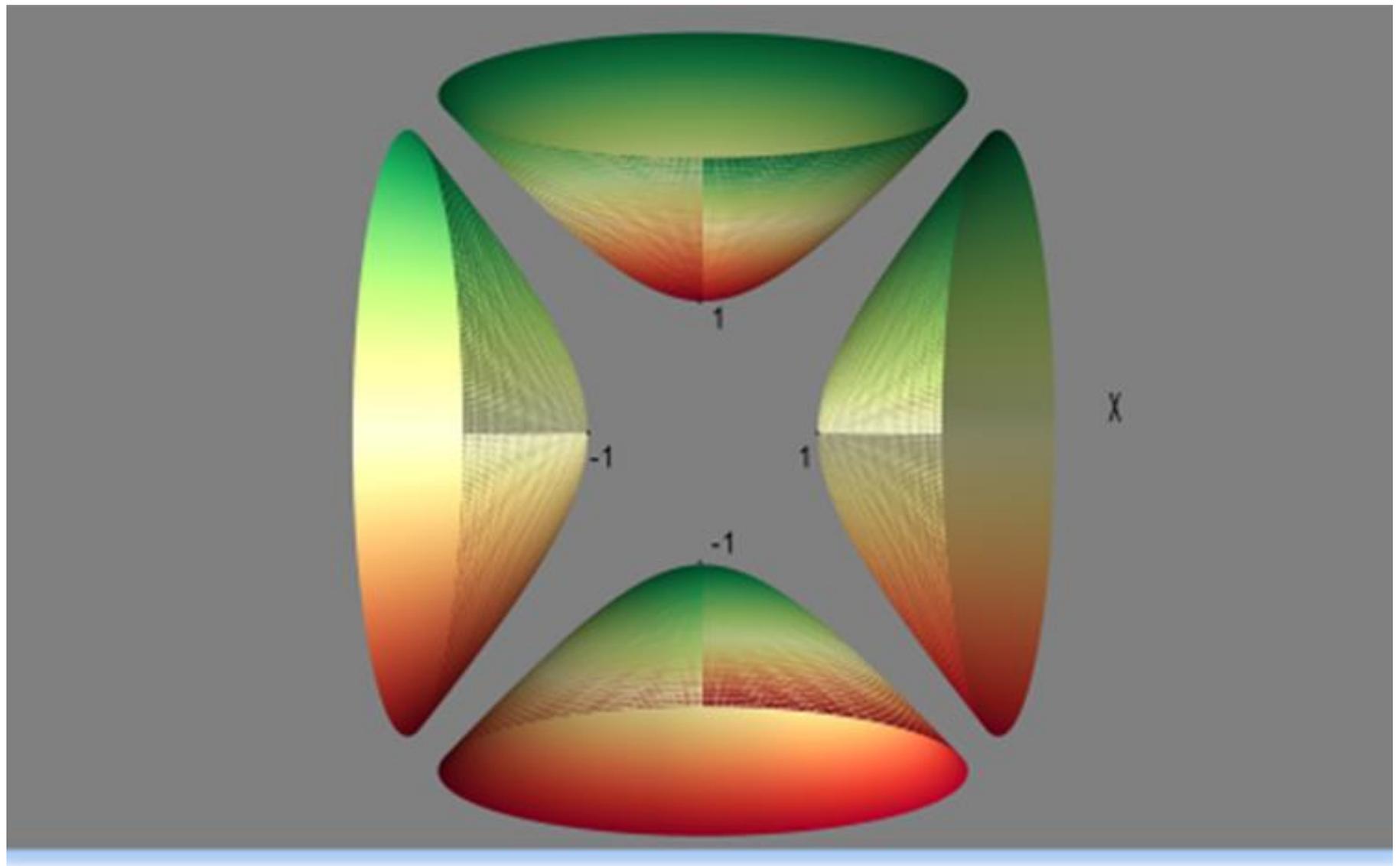
$$(X^2 - T^2) = \pm[X, T] = \pm 1, \quad 1 = 2\varepsilon_0, \quad (n = 0)$$

the quantum light cone

- $[X, T] = 0$: $X = \pm T$ **the classical light cone.**



The known classical light-cone (future and past) of classical relativity in a space-time diagram is a special case of the Quantum light -cone



The quantum light-cone in a space-time diagram (time is the vertical axis).

Copyright Norma G. Sanchez

Quantum discrete cosmological levels

size, time, vacuum energy, Hubble constant and gravitational (Gibbons-Hawking) entropy.

For each level $n = 0, 1, 2, \dots$,

All phases are covered:

post-planckian universe levels: (in planck units):

$$\text{Hubble constant } H_n = 1/\sqrt{2n+1}$$

$$\text{Vacuum energy } \Lambda_n = 1/(2n+1)$$

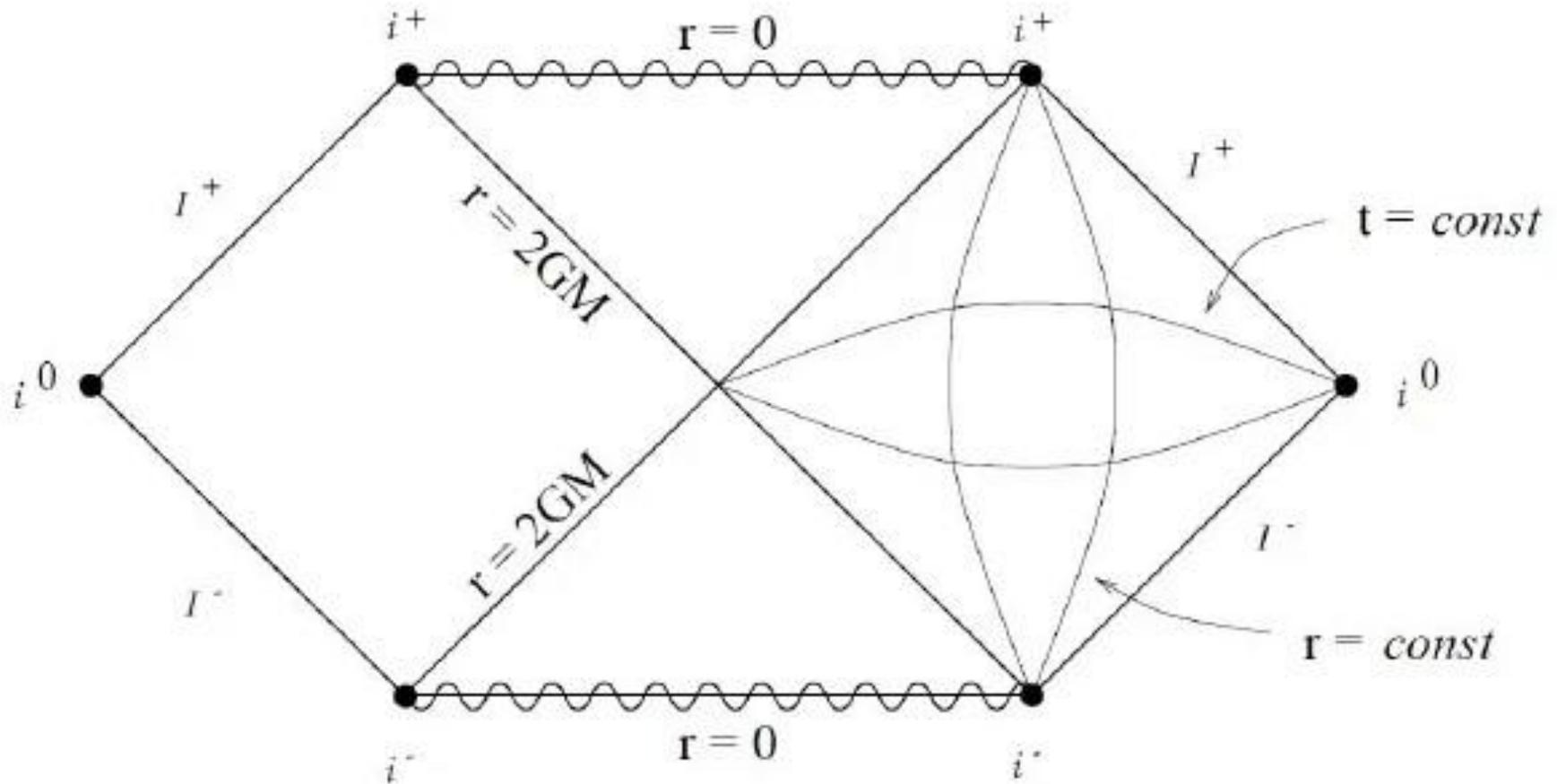
$$\text{Entropy } S_n = (2n+1)$$

As n increases, radius, mass and S_n increases, H_n and Λ_n decreases and *consistently* the universe *classicalizes*:

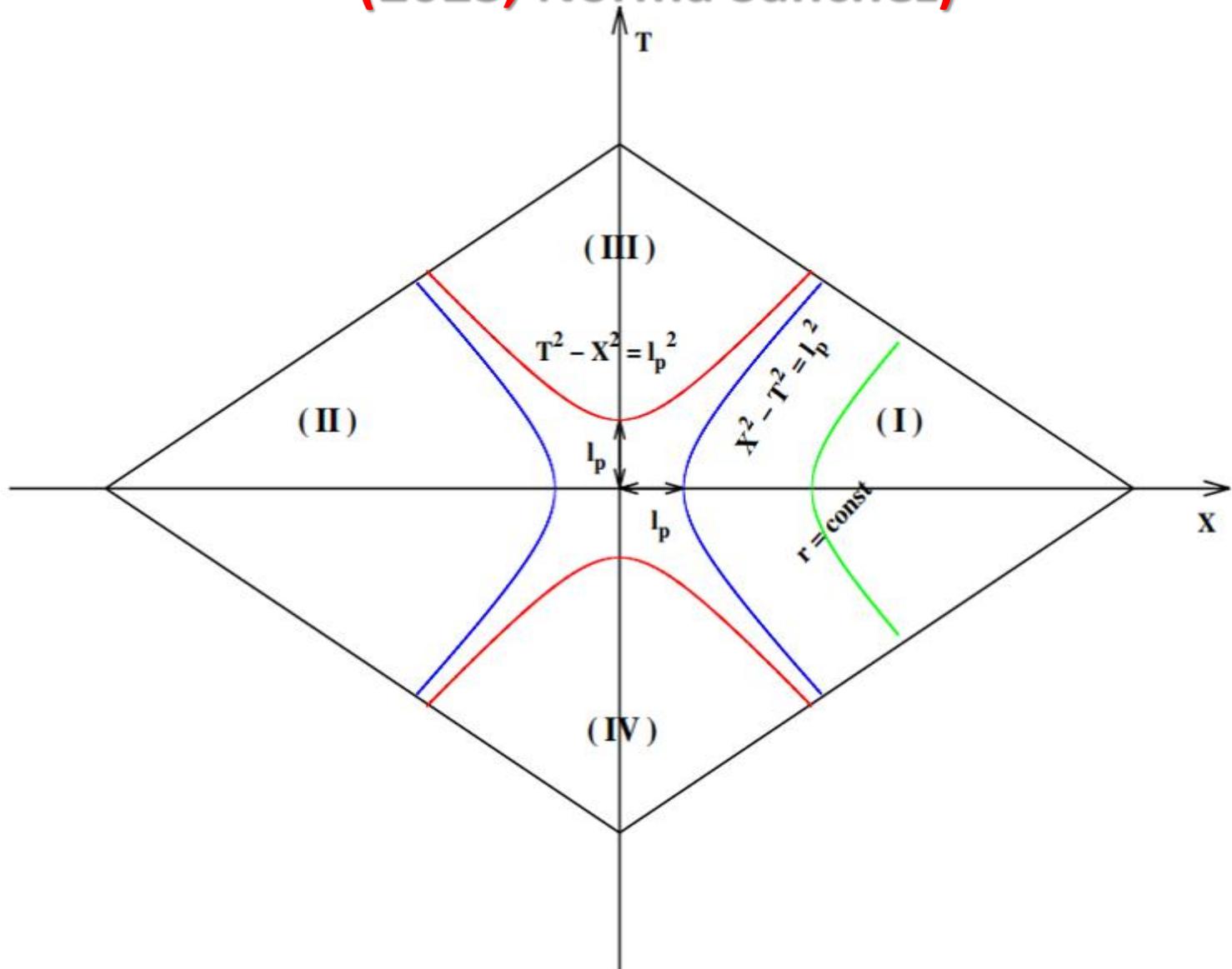
$$n = 10^{122}: \quad H_{\text{today}} = 10^{-61}$$

$$\Lambda_{\text{today}} = 10^{-122}, \quad S_{\text{today}} = 10^{122}$$

The (CLASICAL) BLACK HOLE PENROSE DIAGRAM (1967, Roger Penrose)



The NEW (QUANTUM) BLACK HOLE PENROSE DIAGRAM (2023, Norma Sanchez)



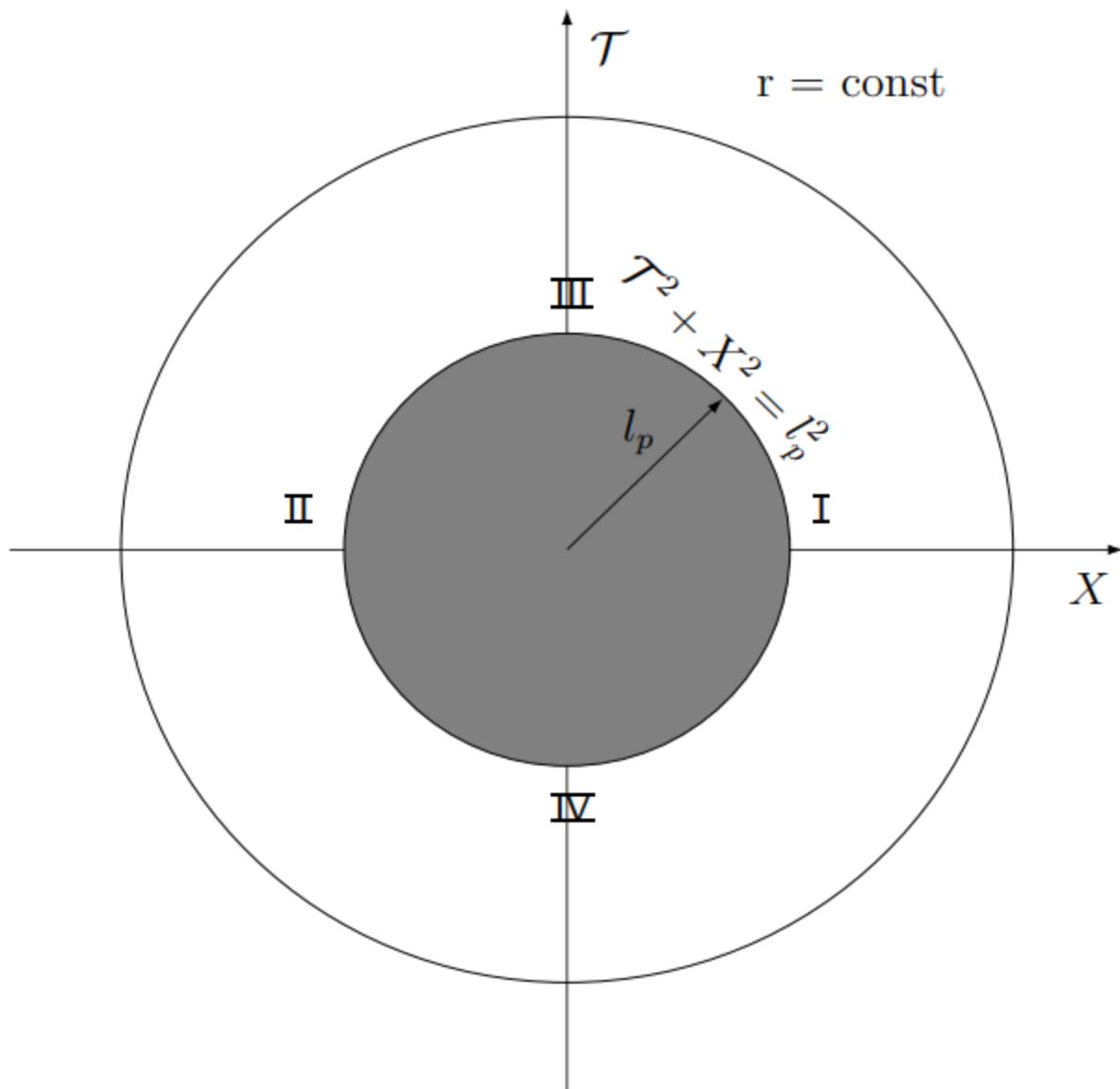
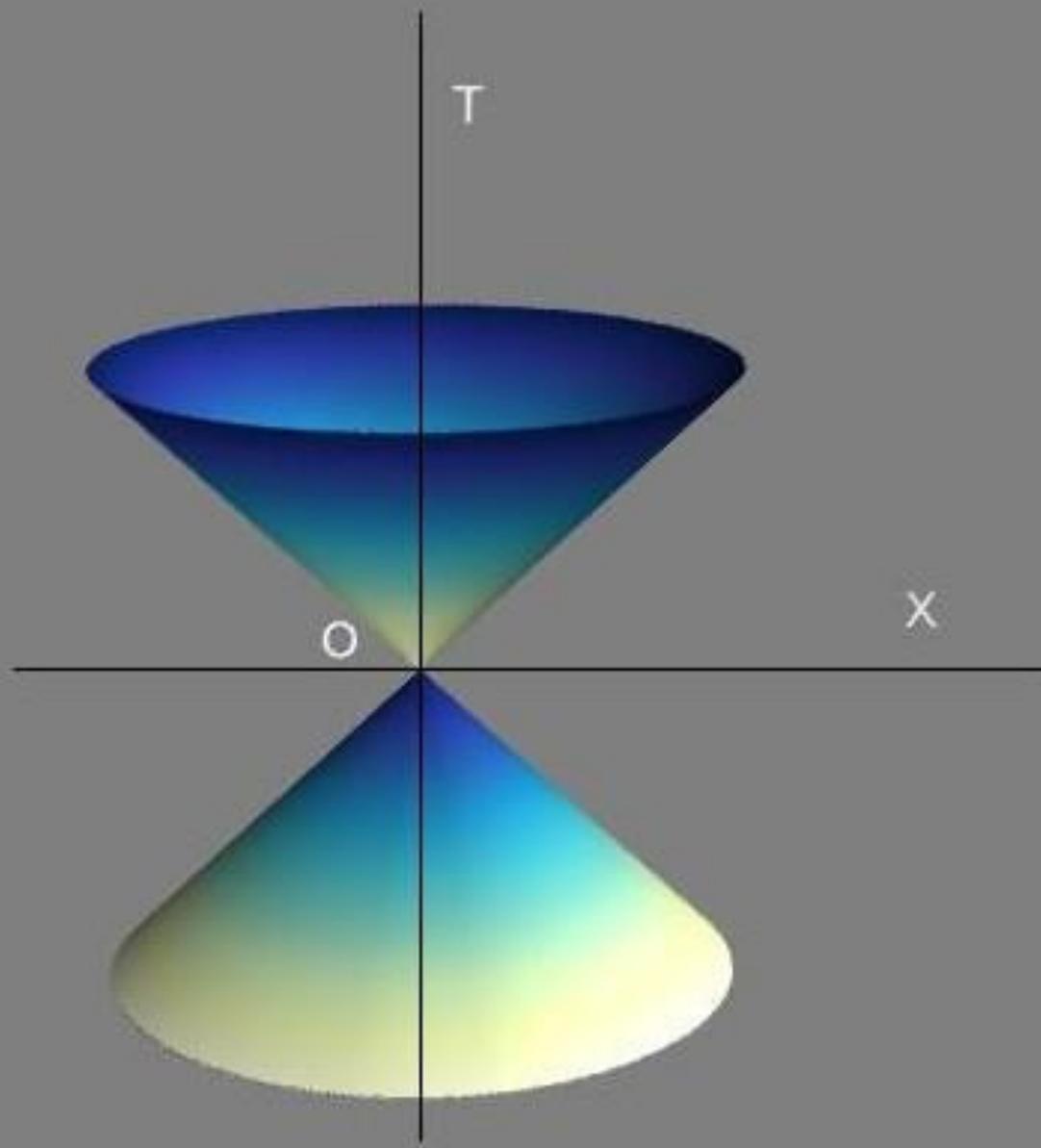
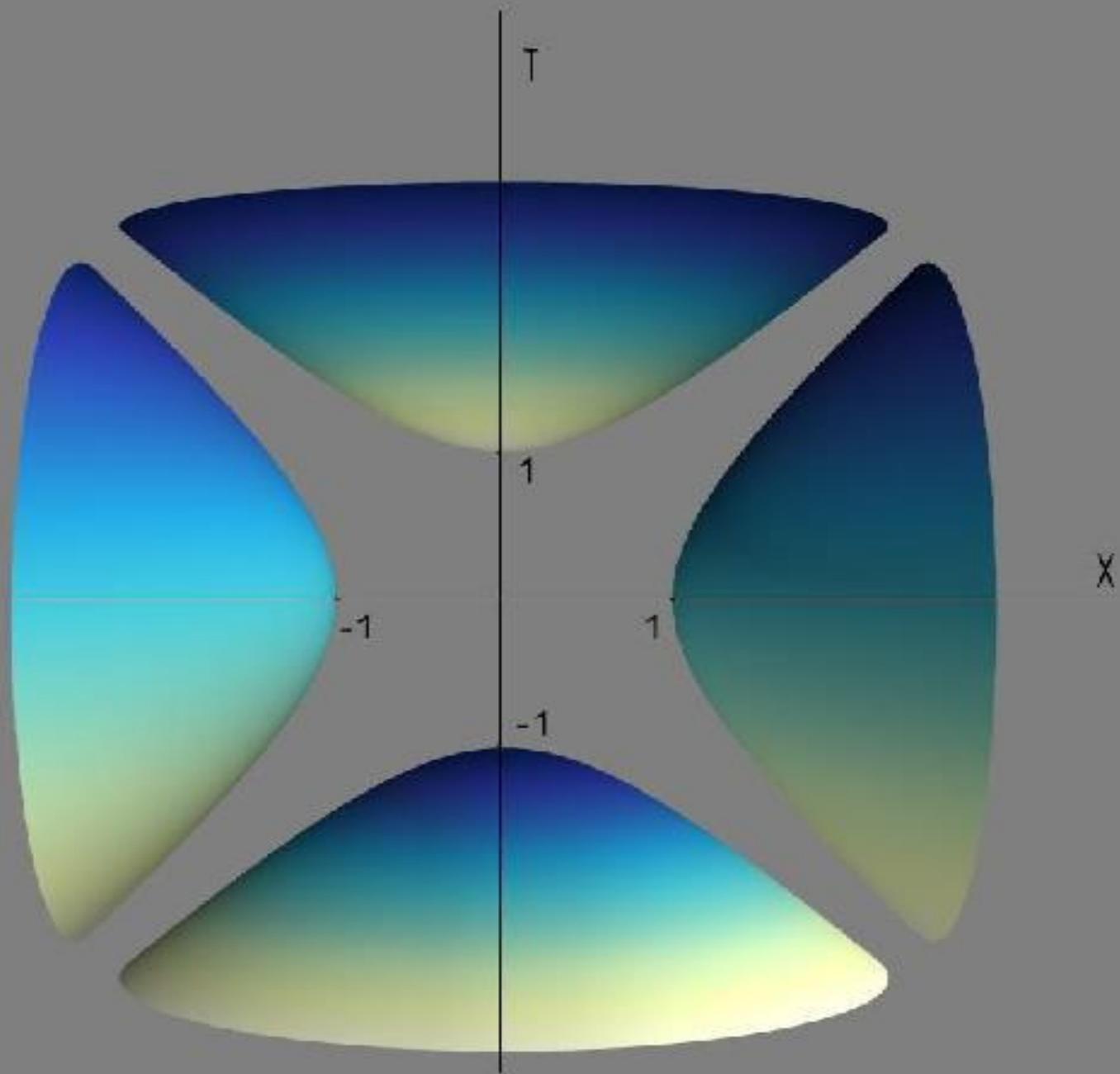
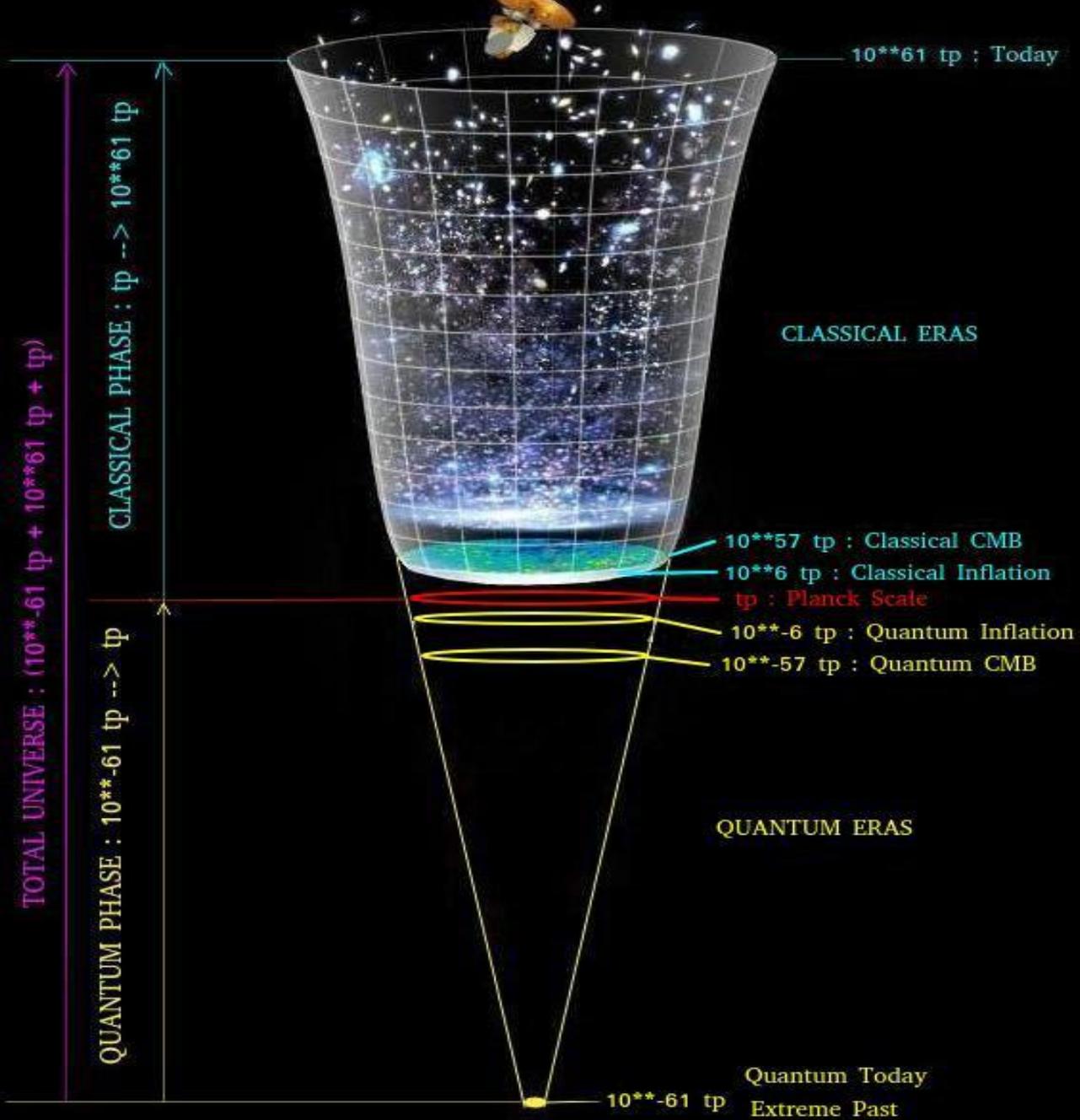


FIG. 2. The quantum gravitational instanton of the Schwarzschild-Kruskal black hole (imaginary time: $T = i\mathcal{T}$, $t = i\tau$). The classical null horizons corresponding to the



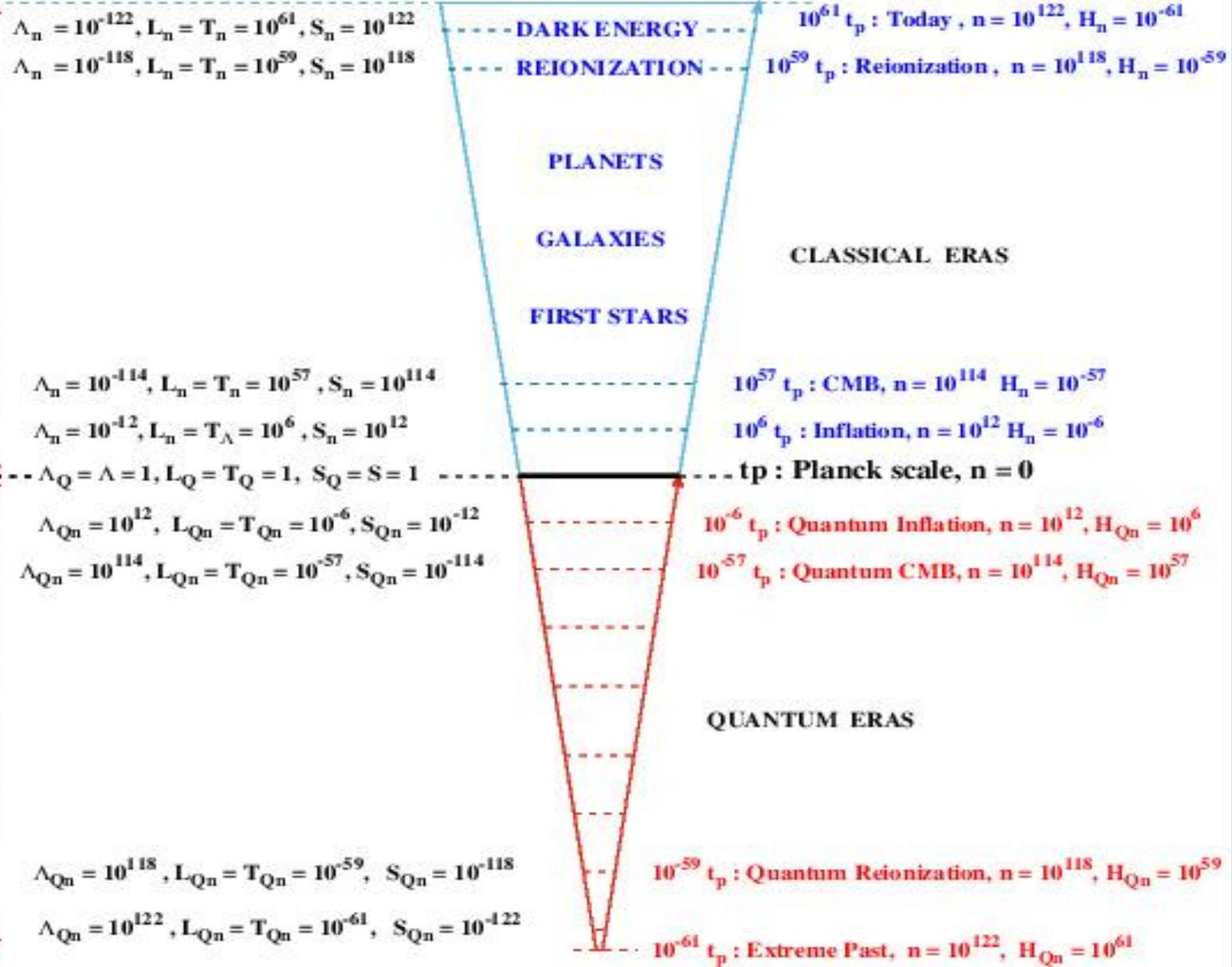




THE TOTAL HISTORY OF THE UNIVERSE

TOTAL UNIVERSE : $(10^{-61} t_p + 10^{61} t_p + t_p)$

CLASSICAL UNIVERSE : $t_p \rightarrow 10^{61} t_p$
 QUANTUM UNIVERSE : $10^{61} t_p \rightarrow t_p$



QUANTUM DISCRETE LEVELS OF THE UNIVERSE AND THEIR TOTAL HISTORY

Quantum discrete levels of the Universe from the early trans-Planckian vacuum to the late dark energy

Norma G. Sanchez 

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and Chalonge – de Vega International School Center, Paris, France*



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We go forward in completing the Standard Model of the Universe back in time with Planckian and trans-Planckian physics before inflation in agreement with observations, classical-quantum gravity duality, and quantum space-time. The quantum vacuum energy bends the space-time and produces a constant curvature de Sitter background. We link the de Sitter Universe and the cosmological constant to the (classical and quantum) harmonic oscillator. We find the quantum discrete cosmological levels: size, time, vacuum energy, Hubble constant, and gravitational (Gibbons-Hawking) entropy and temperature from the very early trans-Planckian vacuum to the classical vacuum energy today. For each level $n = 0, 1, 2, \dots$, the two post- and pre-(trans)-Planckian phases are covered: In the post-Planckian Universe $t_{\text{planck}} \equiv t_P \leq t \leq 10^{61} t_P$, the levels (in Planck units) are Hubble constant $H_n = 1/\sqrt{(2n+1)}$, vacuum energy $\Lambda_n = 1/(2n+1)$, and entropy $S_n = (2n+1)$. As n increases, radius, mass, and S_n increase, H_n and Λ_n decrease, and *consistently* the Universe *classicalizes*. In the pre-Planckian (trans-Planckian) phase $10^{-61} t_P \leq t \leq t_P$, the quantum levels are $H_{Qn} = \sqrt{(2n+1)}$, $\Lambda_{Qn} = (2n+1)$, and $S_{Qn} = 1/(2n+1)$, Q denoting quantum. The n levels cover *all* scales from the far past highest excited trans-Planckian level $n = 10^{122}$ with finite curvature, $\Lambda_Q = 10^{122}$, and minimum entropy $S_Q = 10^{-122}$; n decreases till the Planck level ($n = 0$) with $H_{\text{planck}} = 1 = \Lambda_{\text{planck}} = S_{\text{planck}}$ and enters the post-Planckian phase, e.g., $n = 1, 2, \dots$, $n_{\text{inflation}} = 10^{12}, \dots$, $n_{\text{cmb}} = 10^{114}, \dots$, $n_{\text{reoin}} = 10^{118}, \dots$, and $n_{\text{today}} = 10^{122}$, with the most classical value $H_{\text{today}} = 10^{-61}$, $\Lambda_{\text{today}} = 10^{-122}$, and $S_{\text{today}} = 10^{122}$. We implement the Snyder-Yang algebra in this context, yielding a consistent group-theory realization of quantum discrete de Sitter space-time, classical-quantum gravity duality symmetry, and a clarifying unifying picture.

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- **2019 Trilogy**

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- [4] N. G. Sanchez, *The New Quantum structure of the space-time*, J.
Grav & Cosmology **25**, pp 91-102, (2019) (Springer)

https://www.researchgate.net/profile/Norma_Sanchez12

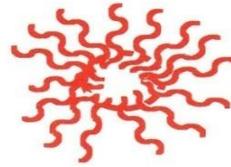
**BLACK HOLE EVAPORATION DOES
THE INVERSE EVOLUTION :**

**BLACK HOLE EVAPORATION GOES FROM
CLASSICAL/SEMICLASSICAL STAGE TO A
QUANTUM (QUANTUM GRAVITY) STATE,**

Through this evolution, the Black Hole temperature goes **from the semiclassical gravity temperature (Hawking Temperature)** to the **usual temperature (the mass)** and the **quantum gravity temperature (the Planck temperature)**.

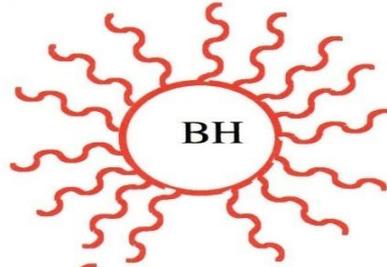
**Conceptual unification of quantum black holes,
elementary particles and quantum states**

BACK REACTION
IMPORTANT

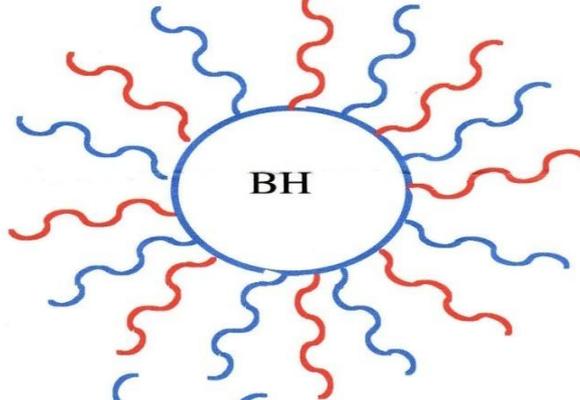


STRING
BACK HOLE
(r_s min, M_{min} , T_s)

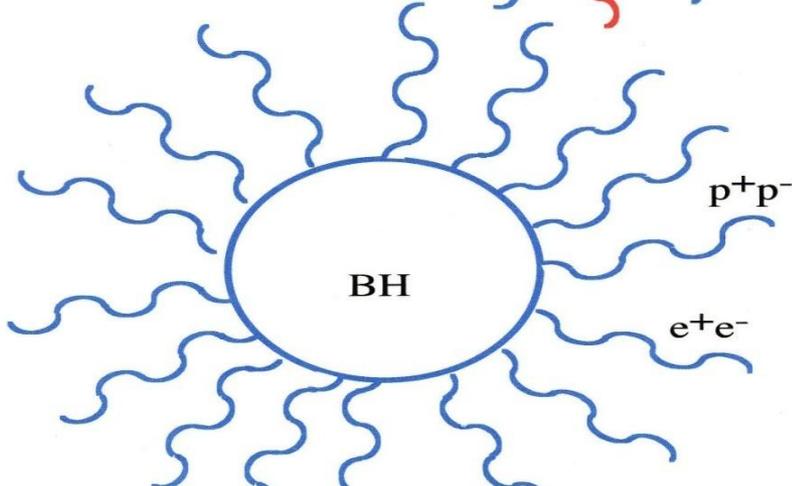
QUANTUM STRING
EMISSION OF
MASSIVES STATES



Γ spectrum
 E_i spectrum
STRING
REGIME



$T_H \uparrow$ increases
(r_s decreases)



$T_H = \left(\frac{D-3}{r_s} \right), r_s$
SEMICLASSICAL
QFT REGIME
(HAWKING RADIATION)

CONCEPTUAL UNIFICATION

- **Cosmological evolution** goes from a quantum gravity phase to a semi-classical phase (inflation) and then to the classical (present cosmological) phase.
- **Black Hole Evaporation** (BH hole decay rate), heavy particles and extended quantum decay rates; black hole evaporation ends as quantum extended decay into pure (non mixed) non thermal radiation.
- The Hawking temperature, elementary particle and Hagedorn (string) temperatures **are the same concept in different gravity regimes (classical, semiclassical, quantum)** and turn out to be the precise classical-quantum duals of each other.

Unifying quantum mechanics with Einstein's general relativity

The quantum nature of gravity is an enigma which has eluded even the brightest of physicists for many decades. Now, Dr Norma G. Sanchez at the French CNRS LERMA Observatory of Paris-PSL Sorbonne Université describes a possible solution. Her approach takes the form of a general theory, incorporating both quantum mechanics and Einstein's theory of general relativity. If correct, her results could bring researchers a step forward in their knowledge of how the physics which plays out on the very smallest of scales can be compatible with that which occurs on the very largest cosmological scales.

The question of whether light is a wave or a particle has baffled physicists since the 17th century. The problem first emerged when Isaac Newton developed his 'corpuscle' theory, which described particles of light which must only travel in straight lines; as seen in the reflection in a mirror. At the same time, however, other physicists including Christian Huygens and Thomas Young proposed that light must propagate as a wave, as it displays properties like diffraction and interference.

In fact, neither of these theories are necessarily 'wrong', since both of them are consistent with experimental observations when the right context is applied. On quantum scales, light travels in packets which we now call photons, but also reliably follows Maxwell's equations, which describe the dynamics of classical electromagnetic waves. To explain how both theories can be correct at the same time, physicists needed a way to unify both classical electrodynamics and quantum physics

into a deeper, more all-encompassing theory. Known among physicists as 'quantum electrodynamics', the theory was by no means simple to develop, but nonetheless, it has been done.

GENERALISING CLASSICAL PHYSICS

At around the beginning of the 20th century, several physicists began work on revolutionary theories to explain why matter appears to behave differently on extremely small scales. In the subsequent decades, the resulting field of quantum mechanics resolved many questions which classical physics didn't have the means to answer. Ultimately, the success of the theory stemmed from the fact that quantum theory is a 'generalised' theory, of which classical physics is just one specialised branch.

This means that while physics appears to be non-classical on quantum scales, classical behaviours emerge on larger scales, where quantum processes become far less relevant overall. Ultimately, therefore, quantum mechanics unites

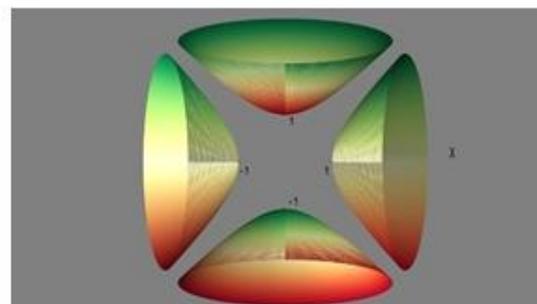


Fig. 1: The quantum light-cone in a space-time diagram (time is the vertical axis). Copyright Norma Sanchez

explanations for physical behaviours which are observed on a variety of scales. Yet despite the successes of quantum theory, physicists have realised for some time that even quantum mechanics is not general enough to explain all of the physics we have observed in the universe.

THE INCOMPLETENESS OF GRAVITY

Again, first described by Newton, the

both quantum mechanics and general relativity are particular branches which are contained on their appropriate scales. To do this, she has incorporated physical theories which have emerged since Einstein first drew out his famous equations. The key point in her approach is that instead of starting from gravity and quantizing it, she starts from quantum theory and extends it to the high energy

Dr Sanchez uses 'semi-classical' gravity as a standard theory, which emerges from her own theories in particular situations.

effects of gravity can be accurately described in many situations using classical physics alone. However, these theories are unable to fully explain all phenomena ever observed by astronomers. Albert Einstein famously resolved this issue through his theory of general relativity. His equations generalised gravity to a more all-encompassing theory; this time, to a geometric model which unites space and time, named spacetime.

Yet although Einstein's theory has been watertight enough to hold up to even the latest astronomical observations, it appears to be completely incompatible with quantum mechanics. For physicists, this calls for an even deeper generalisation, which has been preemptively given the name 'quantum gravity'. In her research, Dr Sanchez aims to realise such a theory, in which

scales where gravity and quantum effects are of the same importance.

BUILDING ON AN INTERMEDIATE THEORY

Later on in the 20th century, a wide variety of intriguing discoveries about the nature of our universe began to emerge. These included Stephen Hawking's celebrated explanations for how black holes decay through radiation, as well as Cosmic Microwave Background radiation – a faint source of light found across the entire sky, which indicates the density structure of the entire universe.

These theories are united in the approximation that matter displays quantum behaviour, but moves around according to a classical description of spacetime. Known as 'semi-classical' gravity, this model acts as a useful bridge between the separated theories of

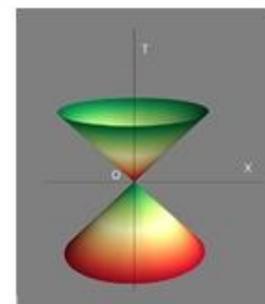
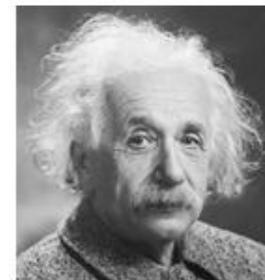


Fig. 2: The known classical light-cone (future and past) of classical relativity in a space-time diagram is a special case of Fig. 1

quantum mechanics and general relativity, and a unified theory of quantum gravity. Because of this, Dr Sanchez uses it as a standard theory, which emerges from her own theories in particular situations.

EXTENDING CLASSICAL-QUANTUM DUALITY

While previous theories which incorporate semi-classical gravity have described vast astronomical structures, Dr Sanchez brings it down to quantum scales in her research. To describe how gravity could work in this regime, she starts from the classical-quantum duality of quantum theory and extends it across and beyond the Planck scale. This is where a unification of three fundamental physical constants occurs: Planck's constant, originating from quantum mechanics; Newton's gravitational constant from classical gravitation; and the speed of light, which Einstein proved to be constant through general relativity.



Einstein's theory of general relativity solved many, but not all, issues relating to gravity.



Dr Sanchez's work could transform our understanding of how the universe works.



Downloaded by OpenStax.com

Dr Sanchez has now started a theory which incorporates these three constants into one unified structure. In doing this, the property of 'wave-particle-gravity' duality, or 'classical-quantum gravity' duality emerges. If Dr Sanchez's calculations are correct, it could provide a solution to the puzzle which has eluded physicists for centuries.

EMERGING RESULTS FROM GENERALISATION

Within Dr Sanchez's universal theory, wave-particle duality of known quantum physics emerges as a special case for when the right circumstances are applied, instead of being a general rule. This means that instead of being at odds with each other, both theories that light is wave-like and particle-like are simply special branches of the same, more deeply rooted theory.

This also allows for the emergence of properties including the classical-quantum duality of spacetime, whose quantum nature has remained highly elusive so far. In addition, Dr Sanchez claims that an entirely new quantum domain emerges which is not present in the classical description of spacetime

– giving physicists a more complete description of its properties. Within this domain, discrete levels of space-time appear at the quantum Planck scale. On classical macroscopic scales, the collective behaviours of these levels appear indistinguishable from the space-time continuum which physicists are more familiar with.

RE-DRAWING THE LIGHT CONE

One particularly important result of Dr Sanchez's theory has been the unexpected emergence of a 'quantum light cone', which doesn't appear within a classical description of the universe. In general relativity, a light cone describes the path taken by light emerging from a single point in time and space; along with all paths taken by the light reaching the point as the flash occurs. The cone shape emerges since all light must reach the same distance from the point at a given time no matter its direction. The boundary of the cone arises because the speed of light is the highest possible velocity throughout the entire universe.

Within Dr Sanchez's theory, the new quantum light cone includes a small space between the tips of the opposite-facing

cones, which are, in fact, hyperbola-shaped instead of pointed. Quantum properties then emerge within this space, in the region of time and space immediately surrounding the flash. On larger scales, where quantum effects are no longer relevant, the classical light cone re-emerges; ultimately allowing both previous theories to work in harmony with each other.

CLASSICAL-QUANTUM DUALITY IN BLACK HOLES

Finally, Dr Sanchez has applied her theory of classical-quantum duality to black holes, whose inner workings are masked by an 'event horizon' from which light cannot escape. So far, this has meant that the physical nature of black hole interiors has completely eluded astronomers.

According to Dr Sanchez, the outer regions of black holes are either classical or semi-classical, while the behaviours of their interiors are totally governed by quantum mechanics. The event horizon disappears at the quantum level, a 'quantum border' emerges at which the interiors and exteriors of black holes become the same on quantum scales. Moreover, the classical space-time central singularity – the point at the centre of a black hole at which curvature had been theorised to become infinite, is avoided in this case. According to Dr Sanchez, the singularity must disappear at the quantum level, to remain consistent with the smearing of singularities on quantum scales.

A TRANSFORMATION IN UNDERSTANDING

Over the past decades, potential solutions to quantum gravity and several types of mathematical dualities have been hotly debated, and it has remained uncertain whether or not our fundamental understanding of physics needs to be completely rethought. But Dr Sanchez understood that it is the physical and universal wave-particle duality of quantum physics which is at the root of the solution. Ultimately, a unified idea of the quantum nature of astronomical-scale phenomena could transform our understanding of how the universe works, and would set the stage for an exciting new era of theoretical physics and cosmology.

One particularly important result of Dr Sanchez's theory has been the unexpected emergence of a 'quantum light cone'.



Behind the Research

Prof Dr Norma G. Sanchez

E: Norma.Sanchez@obspm.fr T: +33 (1) 40 51 23 03 W: <https://norma.obspm.fr/~sanchez/>

Research Objectives

Prof Dr Norma Sanchez's theory unifies quantum mechanics with Einstein's general relativity.

Detail

Norma G. Sanchez
CNRS-LERMA, Observatoire de Paris - PSL University, Sorbonne University
77, avenue Denfert-Rochereau
75014 Paris
France

Bio
Prof Dr Norma G. Sanchez is director of research at the French National Centre

for Scientific Research and director of the International School Daniel Chalonge - Hector de Vega. Her first work was on the scattering and absorption theory by black holes and Hawking radiation, she obtained for the first time the whole absorption spectrum of the black hole, (French Thèse d'État, 1978), connected Einstein equations to other known non-linear theories and their solutions,

developed new approaches to quantum fields and strings in curved space-times and found new physical effects. Norma does research in Physical Cosmology, Theoretical Physics, The Standard Model of the Universe from the early to the late universe, with Inflation, the CMB and primordial gravitons, Warm Dark Matter, Dark Energy and quantum physics.

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The present article is one from a trilogy published by the author in 2019 on the subject, and from which much more developments are going on:
Sanchez, N.G. (2019). The classical-quantum duality of nature including gravity. *International Journal of Modern Physics D28*, No. 03, 1950055.

Personal Response

What do you find most inspiring about your work?

“ The fact that it is a creative, endless work with total freedom, motivated by true advance and discovery beyond current knowledge. ”



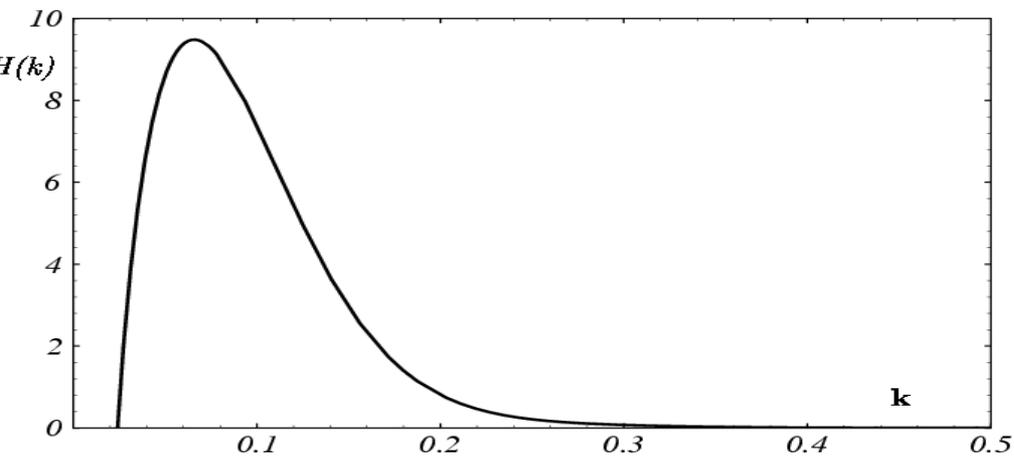


Figure 1: EMISSION BY A BLACK HOLE

4

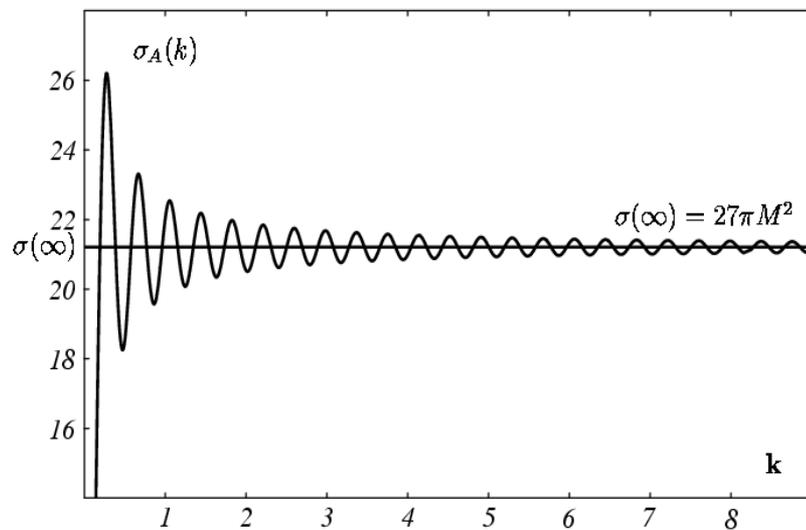


Figure 2: ABSORPTION BY A BLACK HOLE

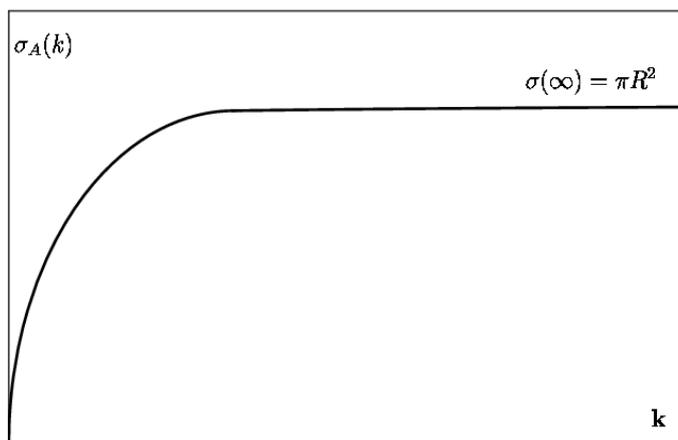


Figure 3: ABSORPTION BY A MATERIAL SPHERE WITH A COMPLEX REFRACTION INDEX

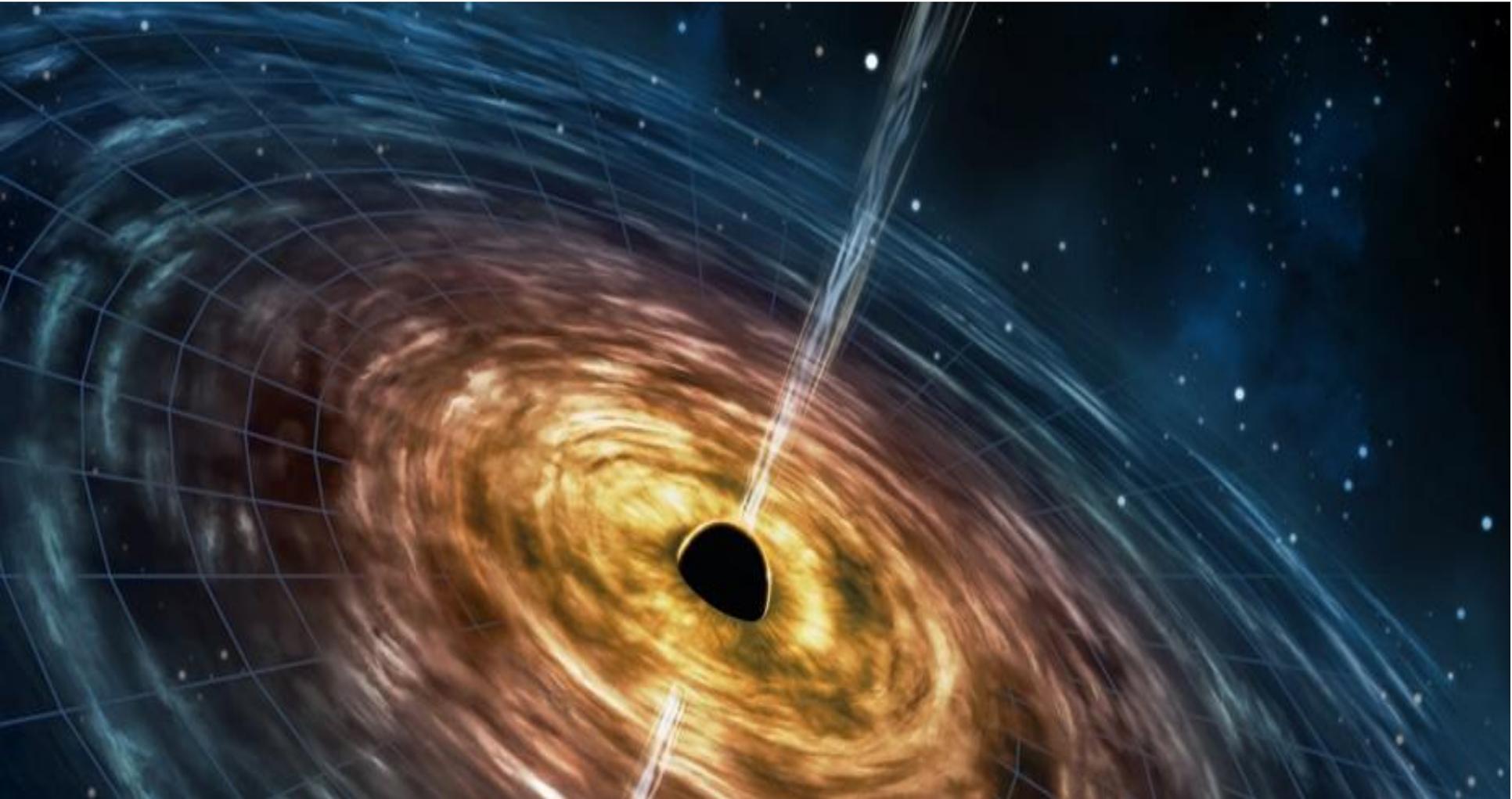
$$\sigma_A(k) = 27\pi M^2 - 2\sqrt{2}M \frac{\sin(2\sqrt{27}\pi kM)}{k}, \quad kM \geq 0.07$$

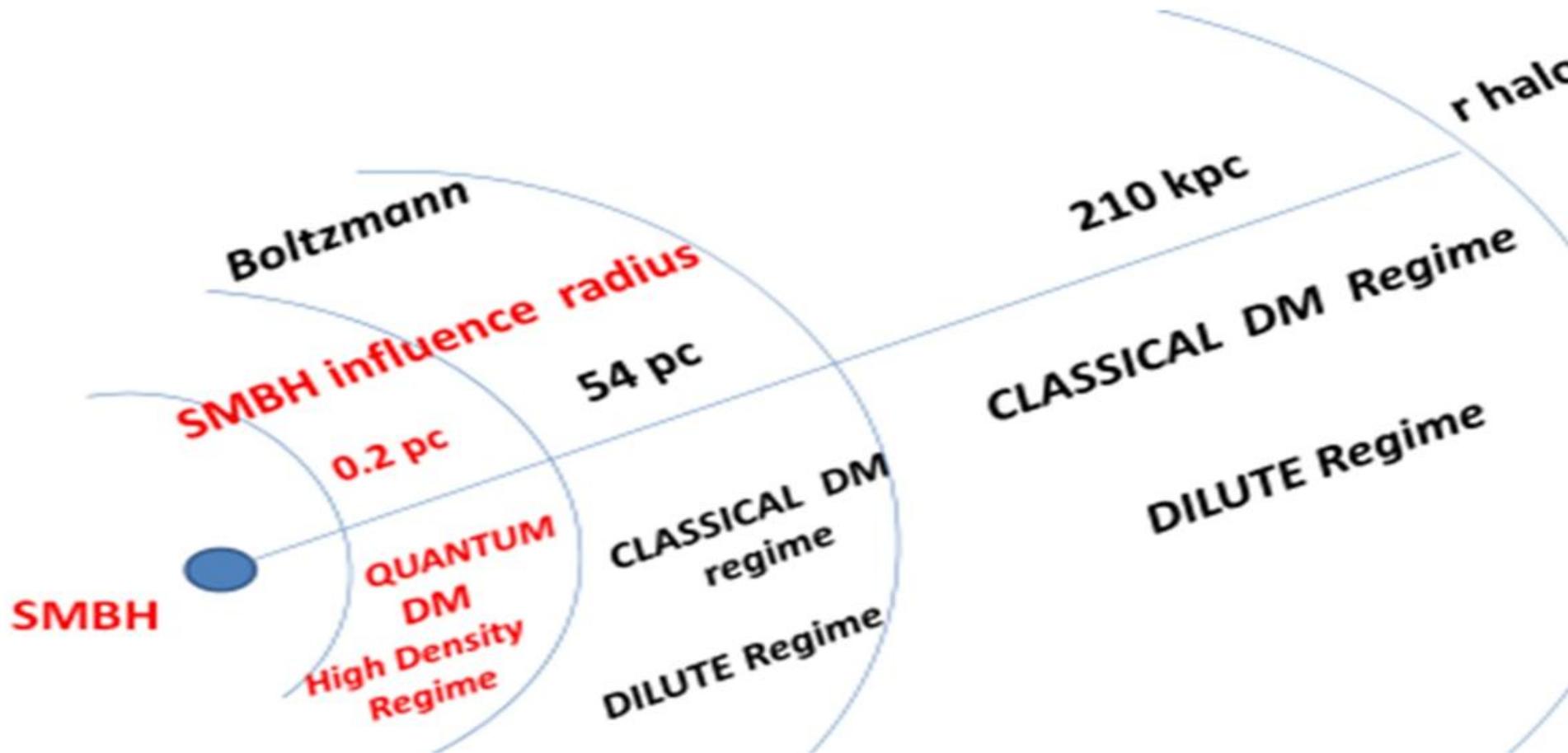
$$\sigma_A(0) = 16\pi M^2$$

The absorption spectrum presents, as a function of the frequency, a regular oscillatory behaviour characteristic of a diffraction pattern (Fig.2). It oscillates around its constant geometrical optics value $\sigma(\infty) = 27\pi M^2$ with decreasing amplitude (as $\frac{1}{(\sqrt{2}kM)}$) and constant period ($\frac{2}{3}\sqrt{3}$). The value of $\sigma_A(0)$ is expressed by $16\pi M^2$. See below.

We have also calculated the Hawking radiation. This is only important in the interval $0 \leq k \leq \frac{1}{M}$. The emission spectrum (Fig.1) does not show any interference oscillations characteristic of the absorption cross section, because the contribution of the S-wave dominates the Hawking radiation. The rapid increase of the Planck factor for $kM \geq 1$ suppresses the contribution of higher partial waves.

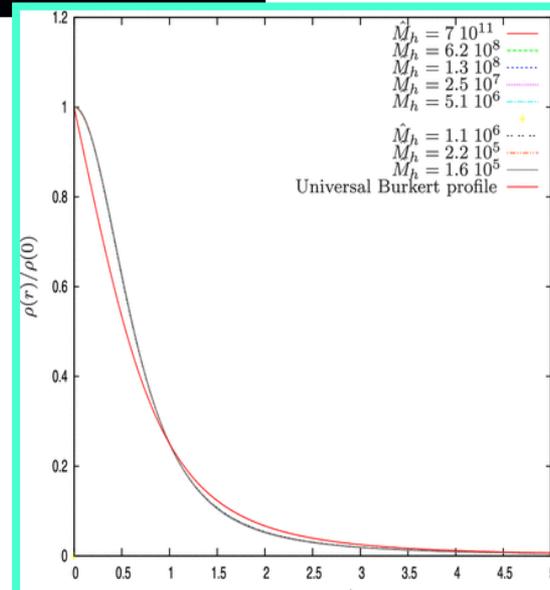
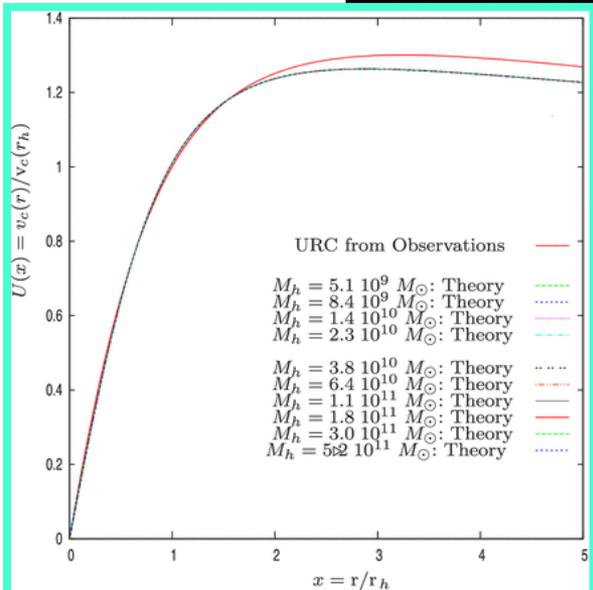
CENTRAL SUPERMASSIVE BLACK-HOLE GALAXY *SYSTEMS*





WDM GALAXIES WITH CENTRAL SUPERMASSIVE BLACK HOLES

Newton, Fermi and Dirac, meet together in Galaxies through keV Warm Dark Matter



DOS NUMEROS CLAVES :
(La Llave del Universo)

**asociados a la densidad primordial y a los
gravitones primordiales:**

$$n_s = 0.9608, \quad r$$

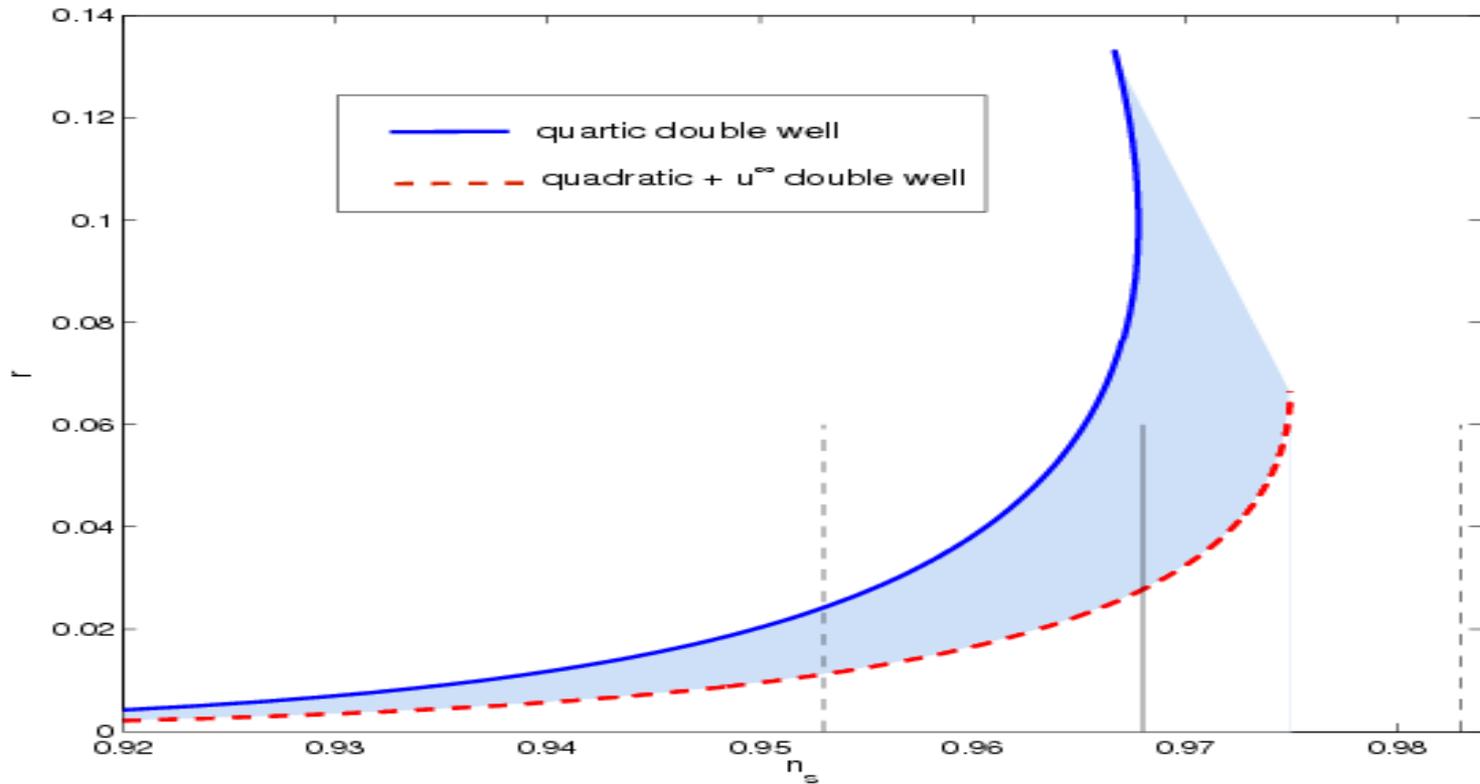
PREDICCIONES

$$r < 0.030$$

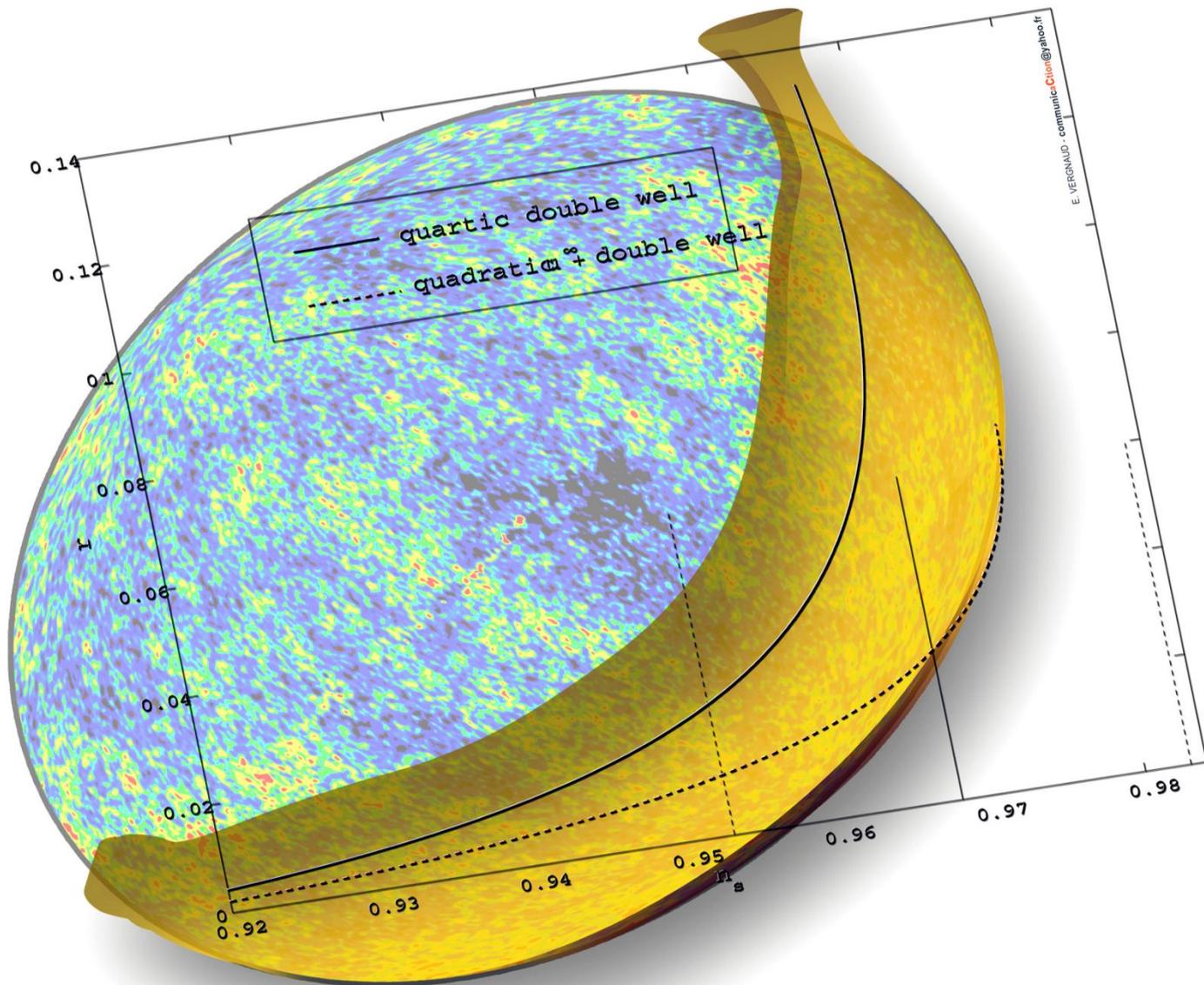
$$r > 0.016$$

$$0.016 < r < 0.030$$

Valor Màs Probable: $r \sim 0.02$



THE PRIMORDIAL COSMIC BANANA



E. VERGNAUD - comunic@cioci@yahoo.fr

THE FUTURE OF THE UNIVERSE

$$a(t) \stackrel{H_0 t \gg 1}{\approx} a_0 \exp [c_1 H_0 t + c_2 (H_0 t)^2],$$

where

$$c_1 = \sqrt{\Omega_\Lambda} = 0.87, \quad c_2 = \frac{1}{4} \Omega_\Lambda \beta_N = 0.19 \beta_N,$$

$$0.00452 < c_2 < 0.00872.$$

In this accelerated universe, Equation (108) shows that the Hubble radius ($1/H$) decreases with time as

$$\frac{1}{H} \sim \frac{1}{H_0 \sqrt{\log a(t)}}.$$

NOUS ET L'UNIVERSE



The Cosmic Web

Large Scale Structure:

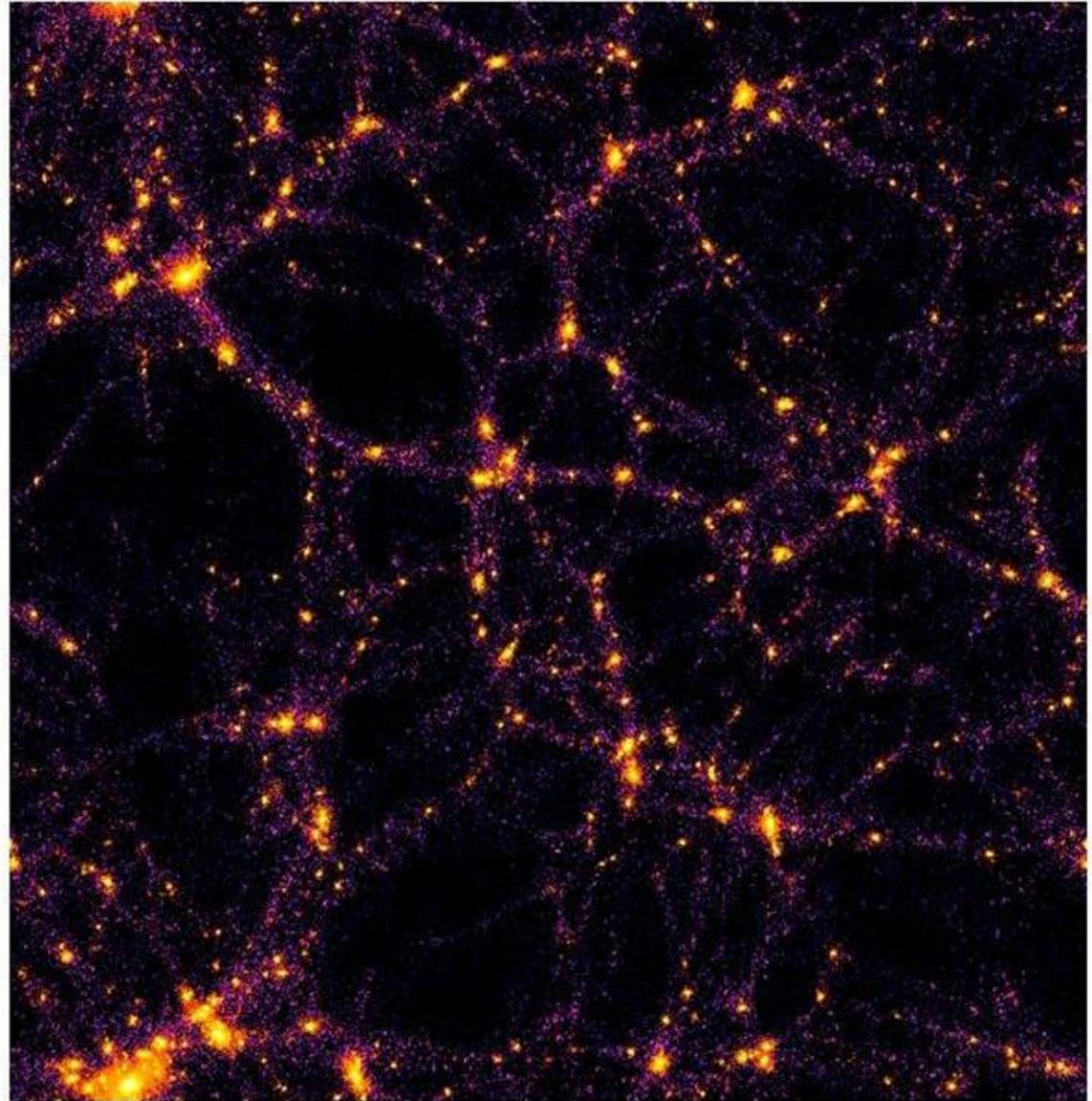
Like Soap Bubbles

Empty Voids

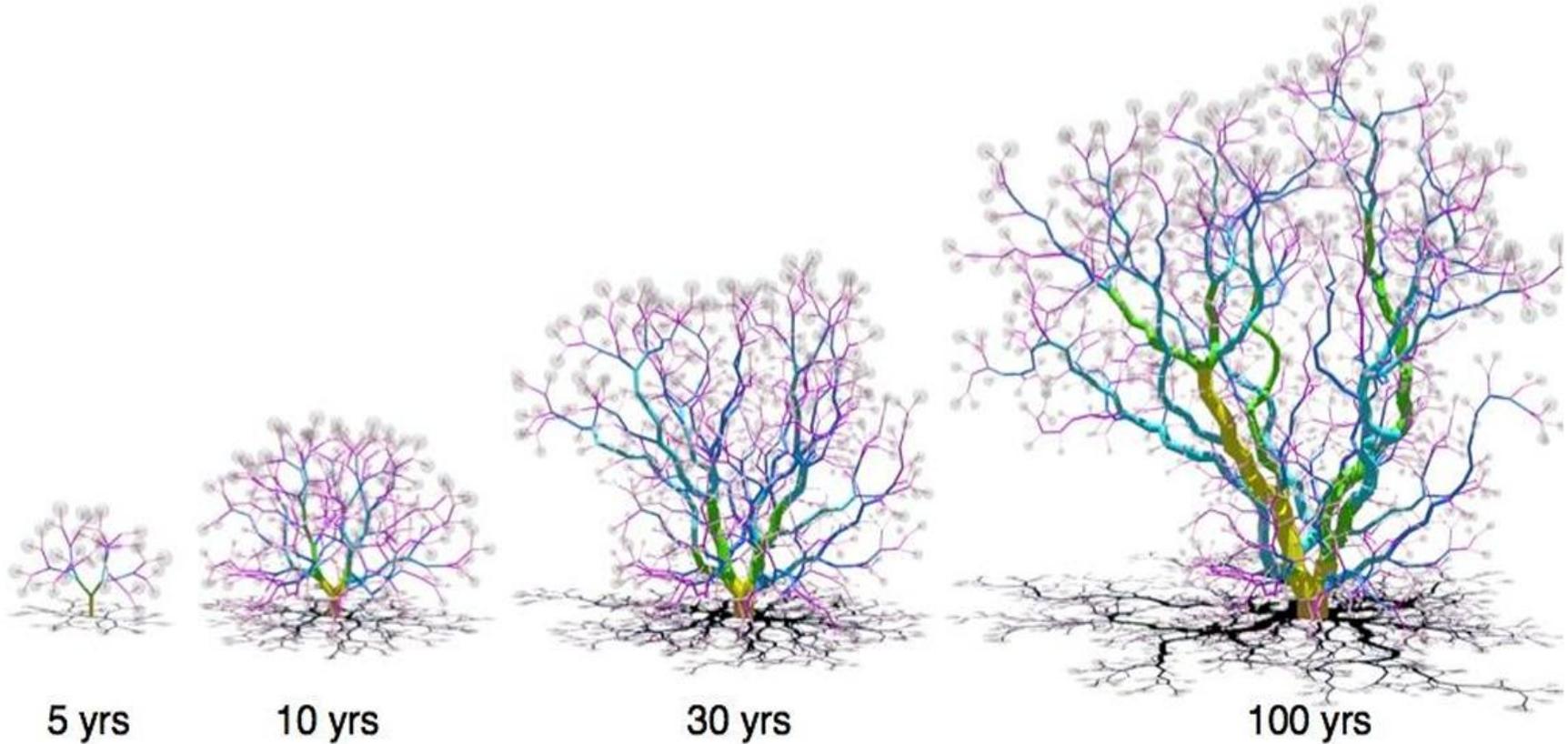
~50Mpc.

Galaxies are in

1. **Walls** between voids.
2. **Filaments** where walls intersect.
3. **Clusters** where filaments intersect.



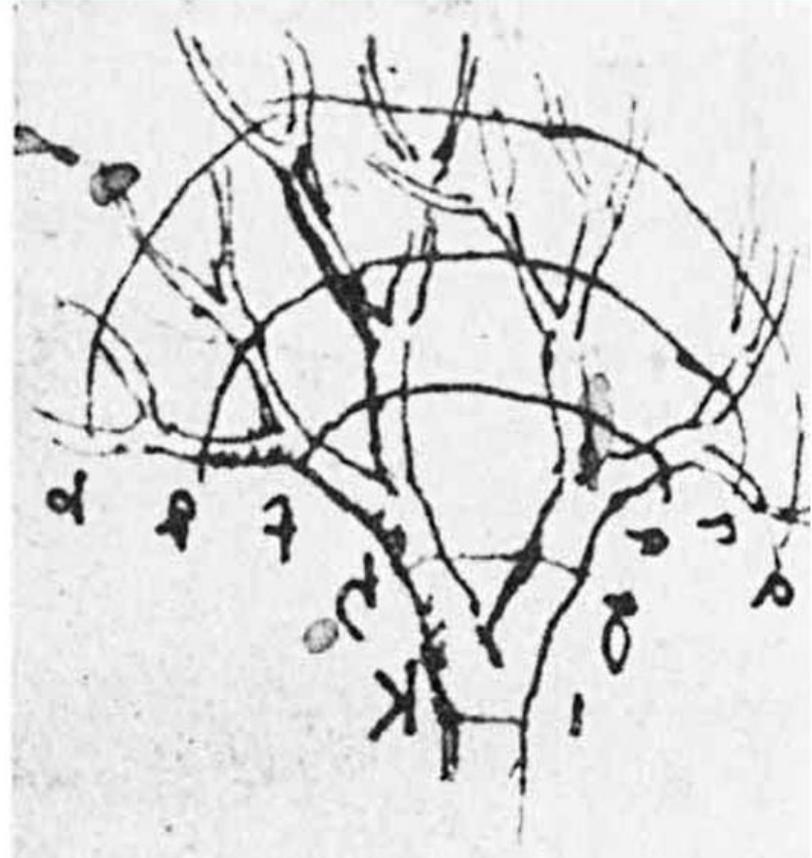
THE FRACTAL STRUCTURE OF TREES



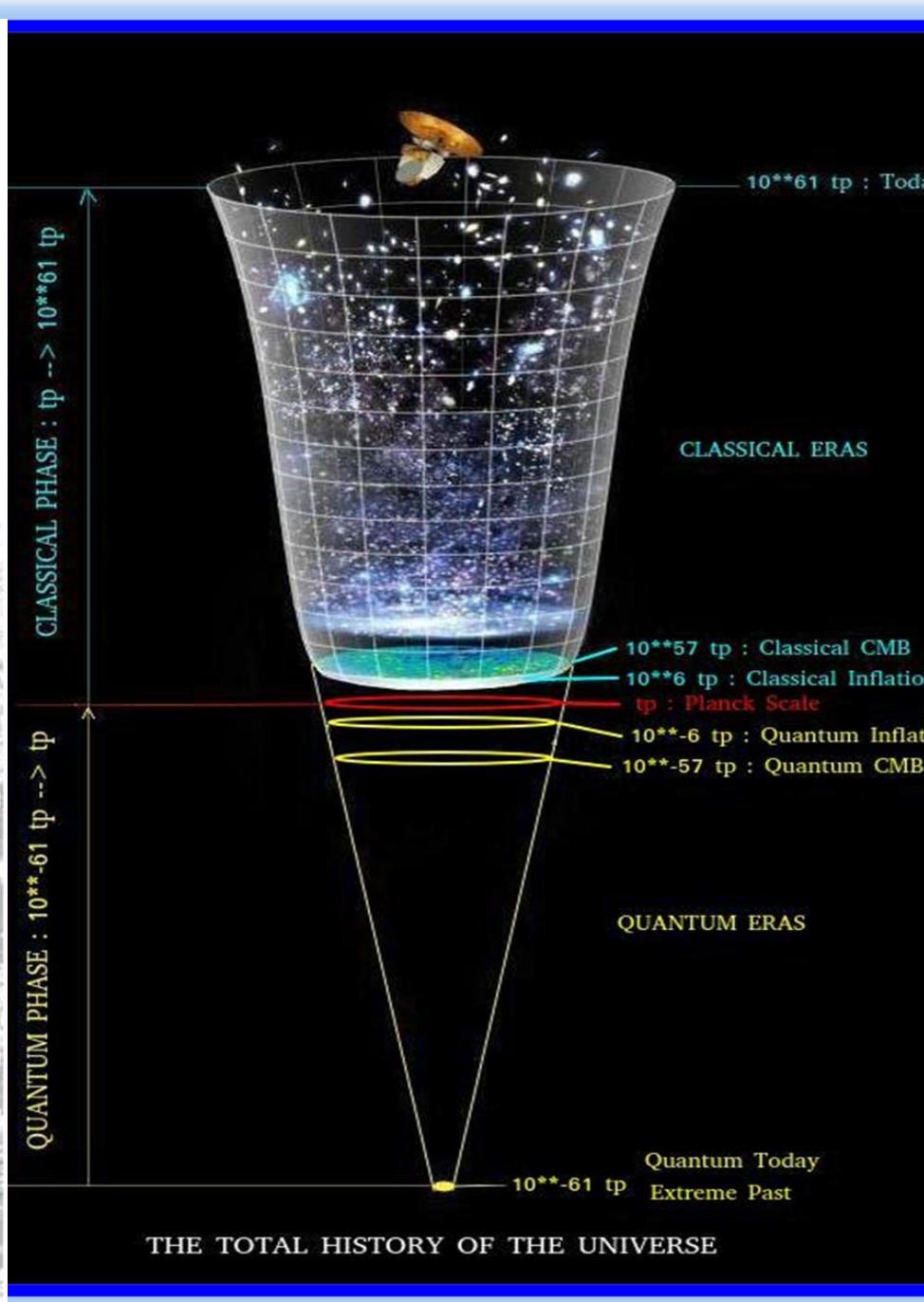
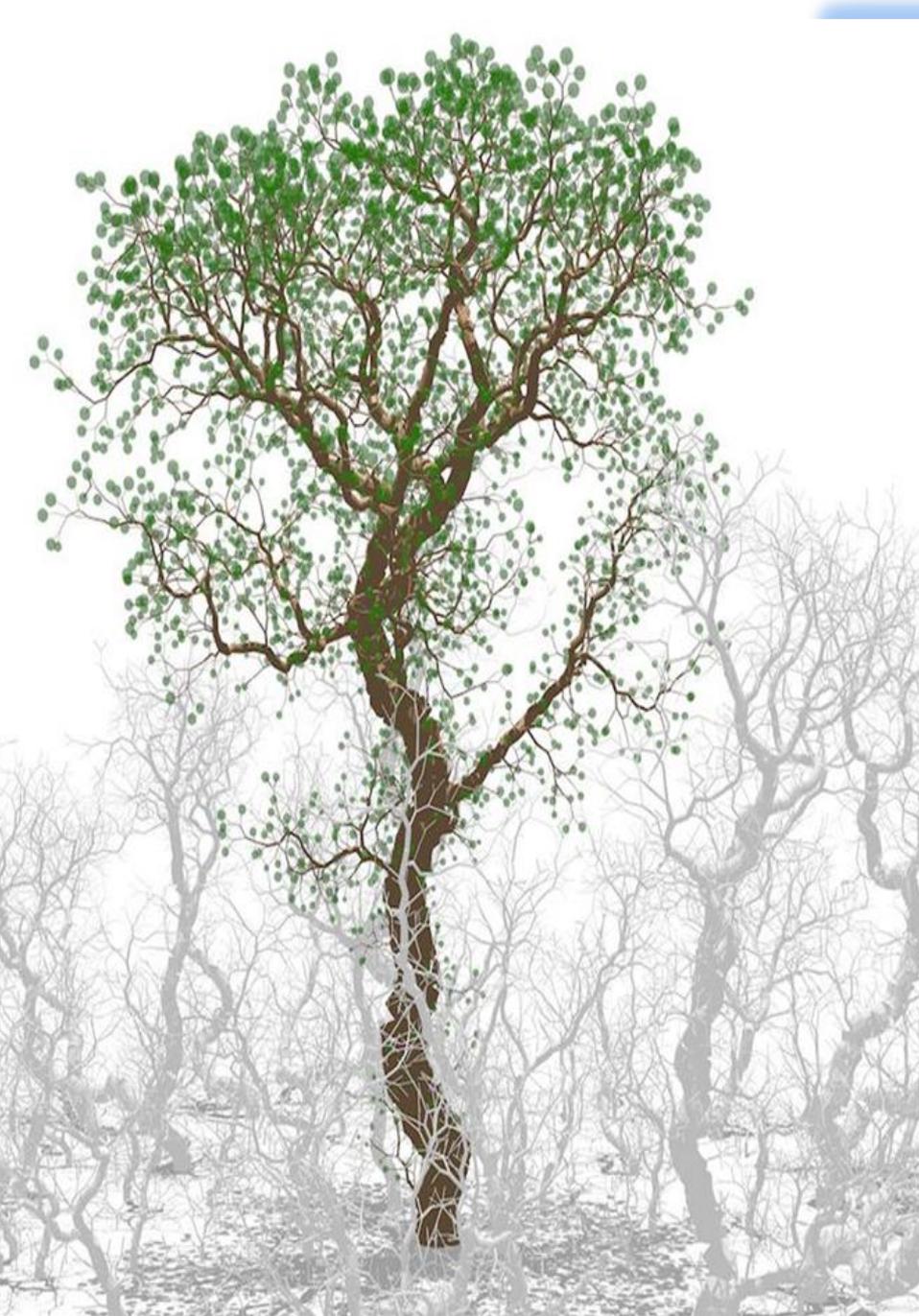
For a fractal medium, the mass depends on the size as

$$M(r) \propto r^D$$

THE LEONARDO DA VINCI FRACTAL TREE



Dessin extrait d'un des carnets de Léonard de Vinci illustrant sa découverte de la loi mathématique gouvernant les diamètres des branches d'un arbre.



GRAVITATIONAL ENTROPY AND TEMPERATURE

$$S = (\text{Area} / 4 a_p) s_p , \quad s_p = \pi k_B$$

$$T = (\text{Area} / a_p)^{1/2} t_p = L t_p$$

Classical: CLASSICAL Lengths

Quantum: QUANTUM Lengths



NUEVO ENFOQUE CONCEPTUAL DE LA FOTOGRAFÍA COMO UN SISTEMA MODERNO CUÁNTICO

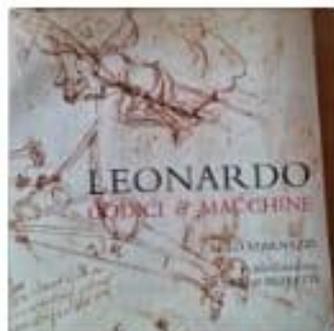
Expositores

Dra. Norma Graciela SANCHEZ y
José Luis MAC LOUGHLIN

8 Nov | 18:00 hs.

Sede Piñeyro | Laboratorio A102 - Cuerpo A
Mario Bravo 1460, Piñeyro

Organiza: Secretaría de Cultura y Producciones Audiovisuales, y
Dpto. de Tecnología y Administración



NUEVO ENFOQUE CONCEPTUAL DE LA FOTOGRAFIA COMO UN SISTEMA DE INFORMACION CUANTICO

New

Article

Full-text available

October 2023

🔒 José Luis MAC LOUGHLIN · 🧑 Norma G. Sanchez

Damos aquí una nueva visión de la Fotografía como un sistema físico cuántico. Los conceptos de la óptica clásica y geométrica resultan limitados y desactualizados para describir desde la física actual y conceptual la totalidad d...

Como los grandes descubrimientos que cambiaron la historia, este también se produce de forma azarosa. En este caso el prestigioso fotógrafo radicado en La Plata José Luis Mac Loughlin asistió a una charla sobre Física Cuántica en la Universidad Nacional de Avellaneda dada por Norma Sánchez, una de las físicas más importantes del mundo que transita su vida entre su Ensenada natal y París, la ciudad que la acogió junto a su esposo en un exilio forzado en los años de plomo de la Argentina.



Norma Sánchez junto al Rector de UNDAV Jorge Calzoni, el historiador investigador Enrique Errosagaray, y



El Daguerrotipo de Louis Daguerre, precursor de la fotografía moderna.



9 noviembre, 23:58 · 🌐

El miércoles 8 de noviembre, en la Sede Piñeyro de la Universidad Nacional de Avellaneda, se llevó a cabo la conferencia "Nuevo enfoque conceptual de la fotografía como un sistema moderno cuántico", a cargo de la Dra. Norma Sánchez, y el fotógrafo José Luis Mac Loughlin. La actividad fue organizada por la Secretaría de Cultura y Producciones Audiovisuales y el Departamento de Tecnología y Administración de la UNDAV.

La Dra. Norma Sánchez, es una física argentina muy reconocida, que llegó a corregir una teoría de Stephen Hawking sobre los agujeros negros, quien lo reconoció públicamente en 2004.

José Luis Mac Loughlin es un reconocido fotógrafo, artista plástico y docente, cuya obra ha obtenido importantes distinciones a nivel nacional e internacional.

La presentación estuvo a cargo de la Lic. María del Carmen Pérez, Vicedecana del Departamento de Tecnología y Administración.

Leé la nota en <https://undav.edu.ar/index.php?idcateg=1&level=0&id=36774>

📷 Fotos: Agustin Alvarez



se dijo en



91.3 MHz

"Después del 19 de noviembre, ya con un ganador, va a haber otro escenario. No creo que sea lo mismo con Javier Milei que con Sergio Massa". Flavia Delmonte (Declaraciones al programa ES LO QUE HAY que se emite de Lunes a Viernes de 10 a 12)

"En esta crisis podría ocurrir que dentro de los sectores dominantes suceda un cambio radical para que no suceda algo más radical". Jorge Altamira (Declaraciones al programa CON DOS DE AZÚCAR que se emite de Lunes a Viernes de 15 a 17)

Para saber más, podés ingresar a la web: www.radiocapital913.com.ar o también seguirla por las redes sociales: **Facebook, Twitter, Instagram y YouTube.**

Sobre twitteando la región

@RubenEsIaiman

#MassaPresidente "En los procesos de desindustrialización como propone el otro candidato se dan las migraciones internas. Nuestro objetivo central para todo el norte es seguir industrializando para seguir bajando asimetrías", Sergio Massa.

@vtolosapaz

La Argentina no puede poner la inexperiencia, incertidumbre e insensatez en la urna. Estamos convencidos de que Sergio Massa es el candidato que expresa templanza, responsabilidad, orden, seguridad y previsibilidad, que es lo que necesita el país.

@gkatopodis

A la salida de misa en la Parroquia de la Inmaculada Concepción, hablé con vecinos y vecinas sobre las barbaridades y ofensas que Milei dice sobre el Papa Francisco. Todos los que somos creyentes no podemos ser indiferentes. El Papa es un orgullo para todos nosotros.

Dos eminencias de nuestra región y un nuevo enfoque conceptual: la fotografía como un sistema cuántico

Hace pocos días quedó presentado en la Universidad Nacional de Avellaneda (UNDAV), un trabajo de investigación interdisciplinario (arte y ciencia) elaborado por dos eminencias de nuestra región que, obviamente, se destacan en lo suyo: la doctora en Astrofísica, Norma Sánchez, nacida en la ciudad de Ensenada y el platense por adopción y el artista conceptual especializado en fotografía, José Luis Mac Loughlin.

Sánchez, actualmente reside en París (Francia) y es Directora de la escuela International School of Astrophysics Daniel Chalonge-Héctor de Vega, CNRS, INSU- Institut National des Sciences de l'Univers, Sorbonne Université, París, Francia, Candidata al Premio Nobel de Física, y Mac Loughlin es Director de EBAF (Escuela Bonaerense de Fotografía) y el museo de la fotografía y el cine David Lucky, reconocido internacionalmente con premios y medallas de oro en concursos y salones internacionales.

El trabajo de ambos abre un nuevo camino conceptual y científico para la fotografía, utilizando la nueva teoría de la información cuántica y a la vez nuevas posibilidades para la creación e invención artística.

Esta es la primera vez que la fotografía es concebida en su integralidad como un sistema cuántico y esto la ubica en un lugar nuevo para el tratamiento de la información, el cine, la creación e inventividad artística y hasta la computación cuántica e Inteligencia artificial.

La Conferencia en la UNDAV

La audiencia en la UNDAV, compuesta de artistas visuales, estudiantes de las carreras de ingeniería e informática, profesores, docentes, escucharon atentamente e interactuaron con los conferencistas mientras se proyectaban simbologías de la matemática y la física cuántica, como el principio relativista de Einstein, formulaciones del principio de incerteza de Heisenberg y la bella letra "psi" del alfabeto griego, la mariposa, o mejor la mariposa de Chuang Tzú, que denota el colapso de la función de ondas, que demuestran que la fotografía y el proceso fotográfico es un sistema cuántico.

El trabajo

Luego de una síntesis y perspectiva desde su invención, Da Vinci, Canaletto con sus pinturas de Venecia, Daguerre y el Daguer-



La audiencia estuvo compuesta por estudiantes, docentes y artistas, entre otros.

rotipo (1839) hasta la actualidad, con los sensores digitales, la fotografía es formulada y analizada como un sistema cuántico:

- Desde la toma del sujeto/objeto hasta el procesado, revelado e impreso, donde la toma fotográfica per se es ahora una medición cuántica, la lente misma, el Horizonte de Sucesos, el negativo revelado (fotografía) es ahora una unidad de información cuántica y el interior oscuro de la cámara es el análogo al interior de un agujero negro.

En la superficie bidimensional de la fotografía queda grabada la información medida con el concepto de entropía. La cámara utilizada para la fotografía (medición cuántica) es ahora una máquina cuántica capaz de reproducir la totalidad de la información en la decoherencia cuántica (macrocosmos) hacia el interior cuántico en coherencia, análogo a las partículas que han sido separadas en el espacio y en el tiempo pero que sin embargo están entrelazadas; mantienen el mismo espín, y danzan al unísono.

La información cuántica

Los autores muestran que la información no se pierde en el interior de la cámara (un agujero negro), información

contenida en la unidad de información cuántica (foto).

Cabe señalar que Sánchez, a fines de los '70, planteó al físico inglés Stephen Hawking en su escritorio de Cambridge que la información no se perdía. Hawking sostenía en esa época que la información se perdía en el interior de los agujeros negros, pero luego en 2004 se retractó públicamente.

Sánchez ya había publicado cinco años antes en el Physical Review D (1999) que la información no se perdía.

Nueva Visión

Dan así una nueva mirada en la teoría de la información dejando atrás discusiones bizantinas, obsoletas, oxidadas, discusiones medievales, si la fotografía es arte o no, si es pictorística (pictórica); discusión dada en la superficie misma de la foto, de los haluros de plata o diodos, si es esclava de las artes (según Charles Baudelaire) o no lo es; si es filosófica, metafísica, psicológica o documental (que documenta y que indocumenta). O la esclava de la ciencia a bordo de los telescopios espaciales Hubble y el más reciente James Webb.

Una máquina cuántica, que el espíritu del hombre anhelaba desde hace siglos, que acompaña la vida doméstica, científica, deportiva, social, religiosa, política, en el "teatro de operaciones" de la vida misma y de los sueños desde que ese parisino salió gritando por las calles de París (a modo de Eureka) "He atrapado al sol y le estoy obligando a que me pinte imágenes", París, 1839 análogo al "Inti Gutama" el sol atrapado de los quechuas en Machu Picchu.

Una máquina cuántica (circa 1920-1930) una "Minutera" que ya hacía mediciones cuánticas en plaza San Martín de la ciudad de La Plata, del otro lado un proyector 16 mm (circa 1920) que demostraba la ilusión de movimiento, formaban parte de la instalación espacial o acción performática o puesta en escena cuántica de los autores Sánchez y Mac Loughlin. La audiencia, fascinada y entusiasmada, permaneció después de terminada la reunión, dispuesta a continuar y estudiar sobre este tema.



Mac Loughlin y Sánchez, durante la presentación del trabajo de investigación.

La fotografía como sistema físico
cuántico

Entre La Plata y París un
descubrimiento mundial



<https://lagrancapital.com/2024/02/13/una-revelacion-de-impacto-mundial/>

Q FOTOGRAFIA = SISTEMA CUANTICO DE INFORMACION

Twitter:

<https://twitter.com/SANCHEZALBARRA1/status/1725483936925544585>

Instagram : **<https://www.instagram.com/p/Czuxca2pFWy/>**

Youtube:

https://youtu.be/_1TofCnmOiE?si=YhTIWGOQ7Vjd19CZ

Linkedin:

<https://lc.cx/oKM4NY>



Norma G. Sanchez

added a Research Spotlight seen 17 times

October 21, 2023

We give here a new vision of Photography as a quantum physical system. to describe the entire photographic action from current and conceptual physics. Quantum physics and current quantum information theory provide the fundamental basis for describing all the process. New perspectives do appear

photography

quantum system

quantum information

measurement

fractal distribution

NUEVO ENFOQUE CONCEPTUAL DE LA FOTOGRAFIA COMO UN SISTEMA DE INFORMACION CUANTICO

Article October 2023 · 71 Reads

José Luis MAC LOUGHLIN · Norma G. Sanchez

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II. LA FOTOGRAFÍA COMO UN SISTEMA CUÁNTICO

En la formulación de la Fotografía como un Sistema de cuántico, aparece también una analogía con la física de los agujeros negros.

La correspondencia o conceptos principales son los siguientes:

- La lente óptica pasa a llamarse horizonte de sucesos
- la cámara oscura pasa a llamarse máquina cuántica.
- El interior de la cámara oscura o máquina cuántica es cuántico y se puede comparar en ciertos procesos al interior de un agujero negro (de laboratorio).
- El objeto o sujeto en el exterior de la cámara cuántica está en decoherencia cuántica.
- La toma fotográfica no es más "tomar" ("quitar") sino que es una medición cuántica.
- En esa medición cuántica, el objeto/sujeto llega al horizonte de sucesos aplanándose, tal que *solo un plano* de la profundidad de campo está en foco, y solamente uno, a medida que se acerca se hace *bidimensional*. Al llegar a la lente (horizonte de sucesos), la imagen ("*imago*", "espectro") deviene bidimensional y queda fija, ("congelada") en el tiempo, (o el tiempo de la medición queda fijo, congelado en la imagen).
- El primer estado (estado inicial) es cuántico, monocromático y es el que corresponde al estado negativo: Es la matriz de todos los estados o imágenes posteriores obtenidos a partir de ese estado inicial.

Q FOTOGRAFIA: Nuevo Sistema de Información Cuántico

$$\Psi = C_i \exp[-i\phi] + C_e \exp[+i\phi] \quad (3)$$

$$|\Psi\rangle = c_1 |\Psi_1\rangle + c_2 |\Psi_2\rangle + c_3 |\Psi_3\rangle + \dots$$

IV. LOS ESTADOS NEGATIVO Y POSITIVO DE LA MEDICIÓN FOTOGRAFICA: DUALES CLÁSICO - CUÁNTICO UNO DEL OTRO

$$O_{interior} = \frac{1}{O_{exterior}}$$

Entropia \implies Area

$$\rho = \sum_j c_j |\Psi_j\rangle \langle \Psi_j|$$

(3) Es la primera vez que la fotografía es caracterizada como un sistema cuántico, de medición e información, y en su *totalidad*: medición, estado inicial negativo, análisis de datos, positivización, estado final positivo, información contenida o entropía, bidimensionalidad o superficie de la misma ...

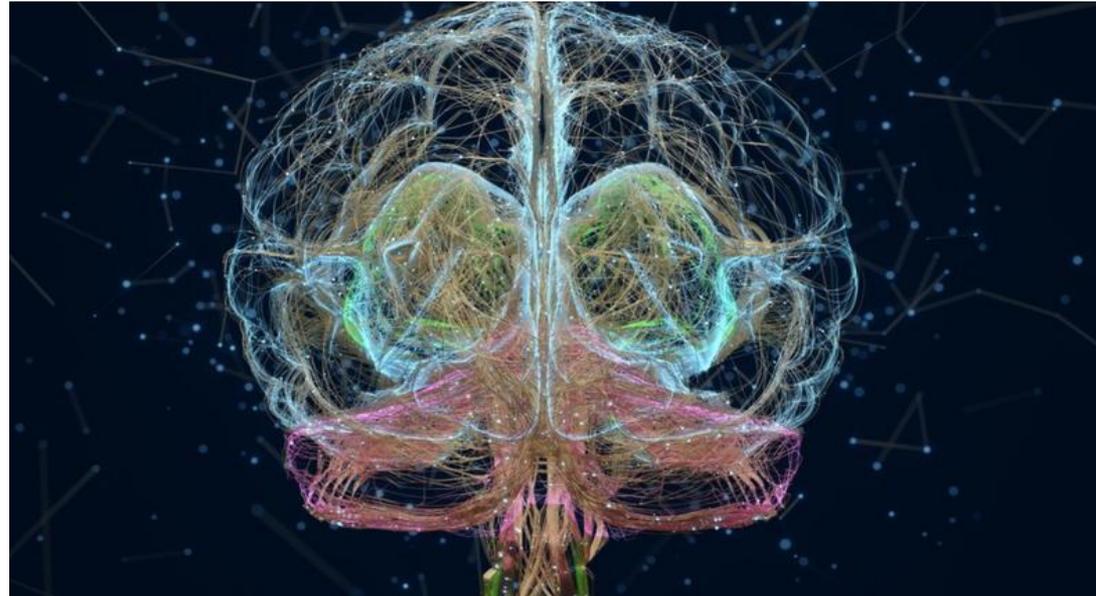
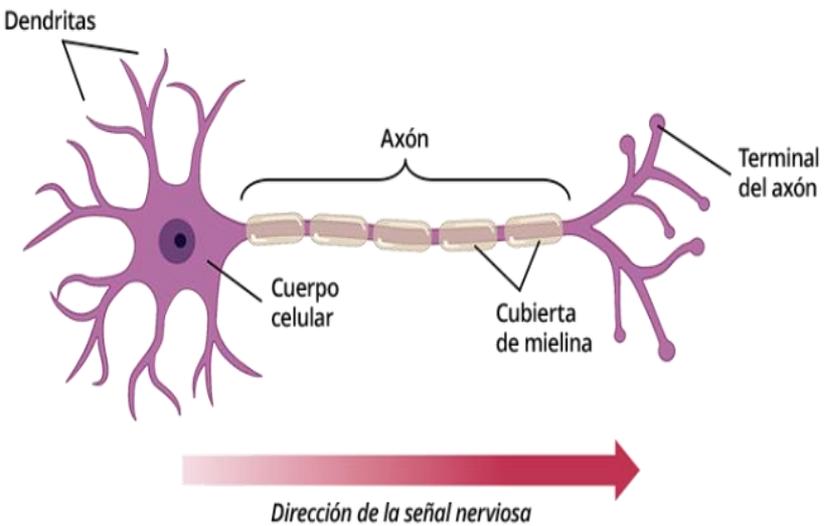
(4) En su totalidad, el sistema fotográfico se describe en términos de los principios fundacionales de la física cuántica y de la teoría de la información: dualidad clásica-cuántica u onda-partícula, incerteza intrínseca cuántica, coherencia-decoherencia cuántica, aparato de medida, medición, sistema observado... La función de onda y la matriz densidad de la medida son explicitadas teniendo en cuenta el tratamiento de la información (digital y analógico).

(5) Incluimos la geometría y estadística fractal como la más apropiada para el tratamiento de los datos o estados intermedios tanto en el proceso analógico (distribución de la granularidad y vacuidad o lacunaridad) como en el digital (de los sensores, captadores de fotones y vacíos). Y para el cómputo de la entropía, captación y no captación de la información en ese proceso.

(6) Revela una analogía con la física de los agujeros negros: (i) la lente de la máquina de medición como un horizonte de sucesos, (ii) interior y exterior al mismo (iii) entropía como la información contenida en la superficie, (iv) transformación de los estados: cuántico interior al clásico exterior, pasando por la interacción en procesos intermedios ...

La fotografía es medida en unidades *qubits* de información. Y es la primera vez que a la fotografía se la llama "*Unidad de información*".

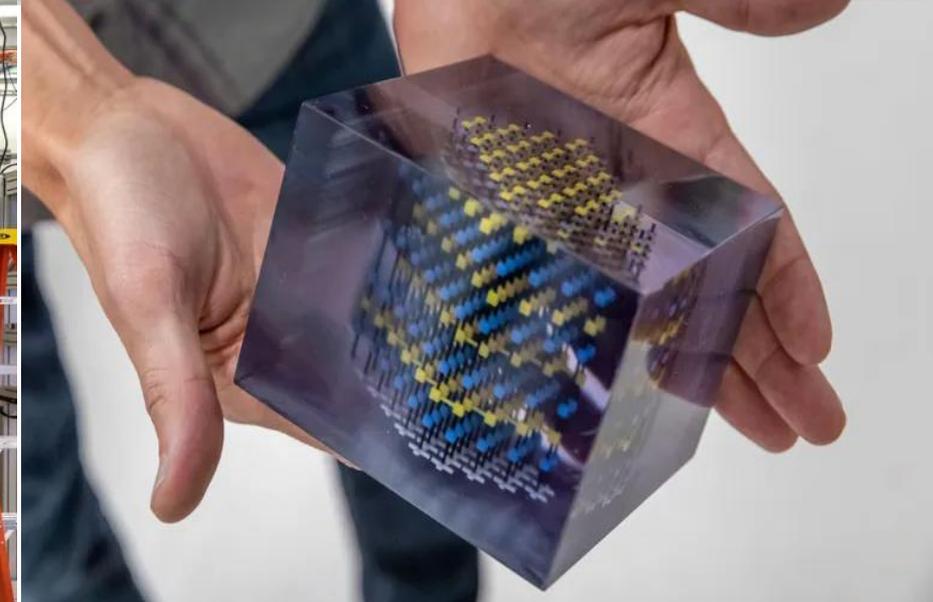
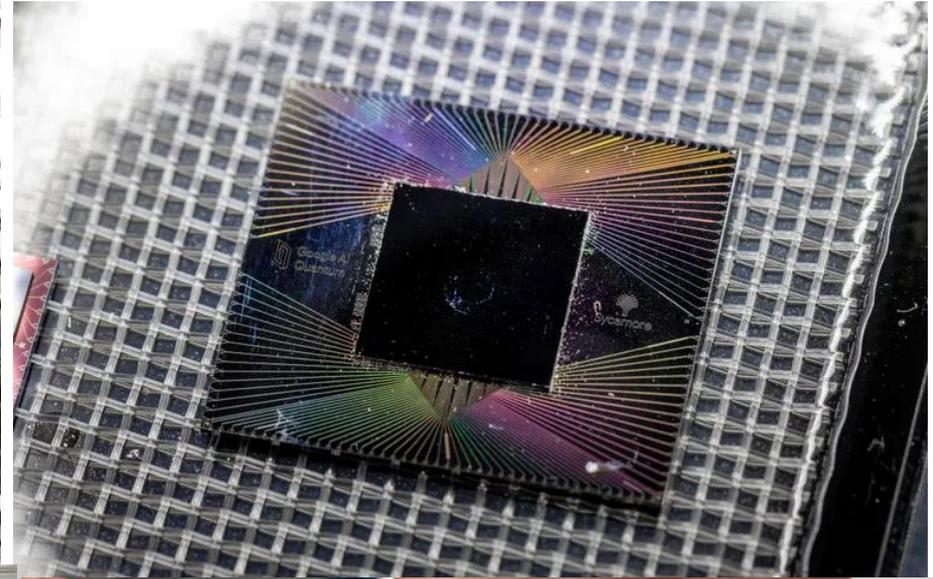
QETRE QHUMAIN





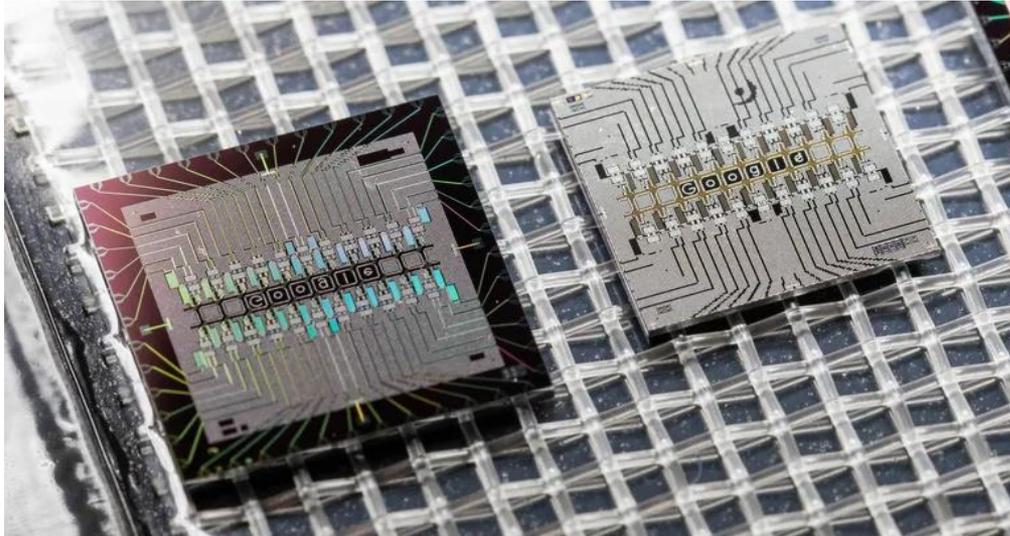
QUANTUM COMPUTING

QIA, QCOMPUTACION QCUANTICA, ...

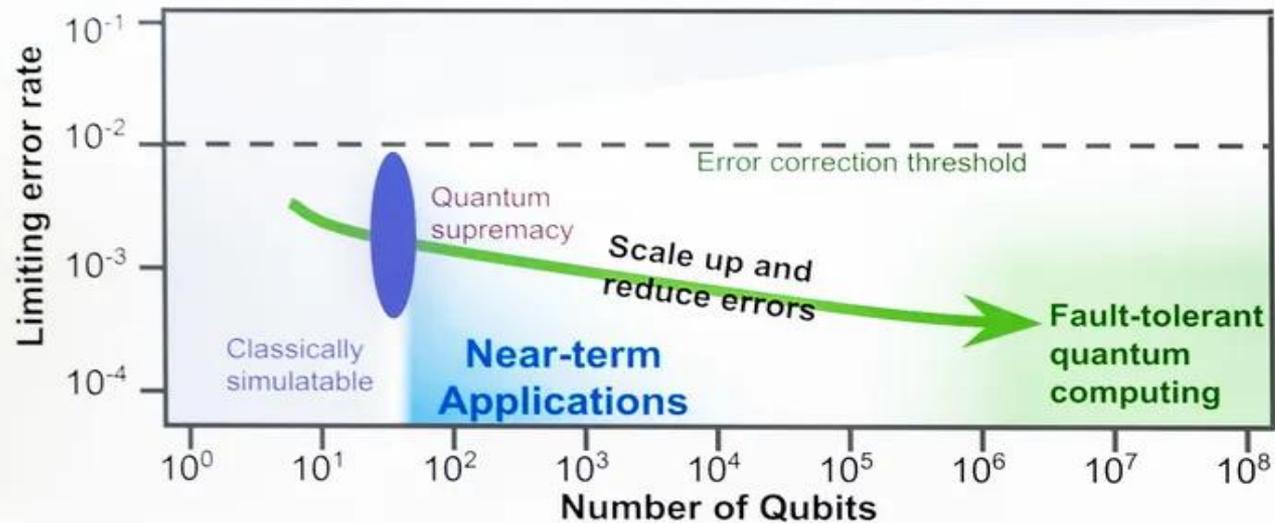


Q COMPUTACION

Q CUANTICA



What is next?



LE TIEMPO: CONCEPTOS

- CAUSALIDAD, **VELOCIDAD MAXIMA: c**
 - **PASADO, PRESENTE, FUTURO: CONO DE LUZ**
- IRREVERSIBILIDAD : **LA FLECHA DEL TIEMPO** →→→
- EVOLUCION, **EL UNIVERSO evoluciona DEL DESORDEN HACIA EL ORDEN**

(DEL CAOS HACIA LA ESTRUCTURACION): => ENTROPIA, Siempre CRECE

- **LA GRAVITACION, ESPACIO-TIEMPO, CLASSICA vs CUANTICA**
 - **EL TIEMPO es un concept CLASICO, SemiCl, Cuantico**
 - **EMERGE a partir du QUANTIQUE**
- **ORIGIN DU TEMPS : VACIO (« NADA ») : VIDE QUANTIQUE ==>**
 - **TIEMPO QUANTICO ==> Niveles Discretos del Tiempo**

The classical Universe today U_{Λ} :

set of physical gravitational observables (age or size, mass, density, temperature, entropy) (L, M, ρ, T, S)

$U_{\Lambda} = (L_{\Lambda}, M_{\Lambda}, \rho_{\Lambda}, T_{\Lambda}, S_{\Lambda})$: Classical Universe

The very early quantum Universe U_Q :

set of corresponding quantum dual physical quantities

($L_Q, M_Q, \rho_Q, T_Q, S_Q$):

$U_Q = (L_Q, M_Q, \rho_Q, T_Q, S_Q)$: Quantum

Universe $U_Q = u_p^2 / U_{\Lambda}$

$u_p = (l_p, m_p, \rho_p, t_p, s_p)$: Planck Scale

The crossing scale between the two gravity domains

- **COSMOLOGICAL EVOLUTION** goes from a **Quantum Precursor Phase** to a **Semiclassical accelerated de Sitter era** (field theory inflation), then to the **Classical phase** until the present de Sitter era.

- The **Wave-Particle-Gravity** duality precisely manifests in this evolution, between the different gravity regimes : **The Evolution of the Universe as a Scattering problem in time.**

- **There is no singularity at the Universe's origin.** Because the more earlier known stages of the Universe are de Sitter (or quasi de Sitter) eras : **The extreme past (at 10^{-61} tp) is a quantum state of high bounded trans-planckian constant curvature and therefore without singularity.**

CONCLUSIONS and IMPLICATIONS

- Different concepts are shown to be precisely **the Same** in the different **Classical** and **Quantum Gravity** regimes respectively. (ex. **Black hole Temperature and Particle Temperature, Entropy...**).

- **Unifying clarifying picture :**
main physical gravitational intrinsic magnitudes of the Universe: **age, size, mass, vacuum density, temperature, entropy**, in terms of **vacuum energy** covering the relevant gravity regimes or cosmological stages: **classical, semiclassical** and **quantum-planckian and superplanckian** - eras.



Merci, Gracias, Thanks, Grazie



MUCHAS GRACIAS
por vuestra Atencion !!

MERCI BEAUCOUP !!
pour votre Attention

THANK YOU VERY MUCH
for your Attention!!

Precursor Quantum phase of the known **Classical Inflation** era and of the classical standard eras and today **Dark Energy**

NEW RESULTS FOR INFLATION

$$[\Delta^S_{QH}] = [\Delta^S_H] \frac{1}{[1 + (H/h_p)^2]} \frac{1}{(1 - \delta\varepsilon_{QH})^{1/2}}$$

$$[\Delta^T_{QH}] = [\Delta^T_H] \frac{1}{[1 + (H/h_p)^2]}$$

H: classical known Inflation (**classical H**) era,

Q: stands for its **Quantum dual precursor**,

QH stands for the Complete Inflation era : **classical known Inflation** and **its Quantum precursor Inflation**.