``*Einsteinian Revolution Misinterpreted :*
No True Black Holes, No Information Paradox, but Just
Quasi-static Balls of Quark Gluon Plasma''
PLENARY TALK in

XXIX-th International Workshop on High Energy Physics "**NEW RESULTS & Actual Problems in PARTICLE & ASTROPARTICLE PHYSICS & COSMOLOGY**",
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by *Abhas Mitra: amitra@barc.gov.in*

Theoretical Astrophysics Section,

Bhabha Atomic Research Centre, Mumbai, India

Also,   Homi Bhabha National Institute, Mumbai, India

http://barc-in.academia.edu/AbhasMitra

- http://www.scribd.com/AbhasMitra
  http://eternalblogs.wordpress.com/ (BLOG)

SR & GR ARE CONSIDERED AS CONCEPTUAL REVOLUTIONS

GR Has Been Termed as ``Most Beautiful Theory'' by Chandrasekhar

For a Free Falling Lab, ``Gravity'' vanishes locally: Inertial Frame: SR Valid

Unlike Any Other Interactions, Gravity cannot be shielded, something very Fundamental: Space Time Curvature

$$F = G\frac{M_1 M_2}{R^2} \qquad \nabla^2 \phi = -4\pi\rho$$

Point Particles + Continuous Distribution of Matter

$$G_a^b = \kappa T_a^b; \qquad \kappa = \frac{8\pi G}{c^4}$$

$$ds^2 = c^2 dt^2 - dx^2 - dy^2 - dz^2; \; g_{tt} = c^2, \; g_{xx} = -1, \; g_{yy} = -1, \; g_{zz} = -1$$

GR Has Passed Many Experimental Tests: Never Failed Any Test
However, there is ambiguity in Localization of Global Energy

Massenpunkt: **POINT MASS**: **Simplest Problem** : **Many Solutions**

Relativistic Astrophysics is Based is the : **Hilbert Solution,**
But ironically this is known as ``Schwarzschild Solution'' T^a_b=0, Vac Sol

$$ds^2 = (1-\alpha_0/R)dT^2 - (1-\alpha_0/R)^{-1}dR^2 - R^2 d\Omega^2; \ d\Omega^2 = d\theta^2 + \sin^2\theta d\phi^2$$

Instead of a ``Point Mass'', one may consider the vac sol outside a finite sphere

$$ds^2 = (1-\alpha/R)dT^2 - (1-\alpha/R)^{-1}dR^2 - R^2 d\Omega^2; T^a_b = 0 \ for \ R > R_b$$

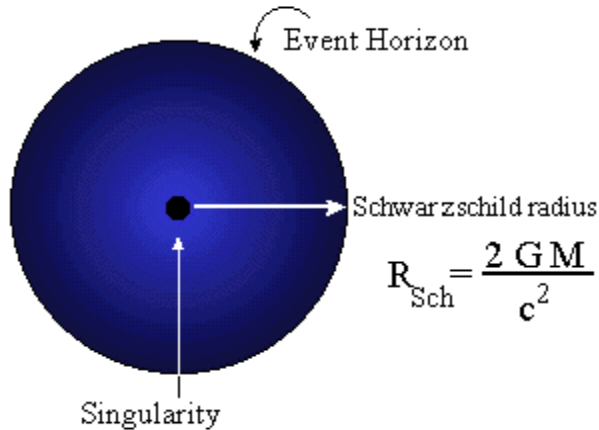**Study CIRCULAR Orbit of a Test Particle Around This Object**

Kepler's 3rd Law $\qquad \omega^2 = \dfrac{1}{2}\dfrac{\alpha}{R^3}; \qquad \omega^2 = \dfrac{GM}{R^3} \rightarrow \alpha = \dfrac{2GM}{c^2}$

From this one PRESUMES that for a Point Mass Too Has a Finite Grav Mass

$$\alpha_0 = \frac{2GM_0}{c^2}$$

$$ds^2 = (1-R_g/R)dT^2 - (1-R_g/R)^{-1}dR^2 - R^2 d\Omega^2; \ R_g = \alpha_0 = 2M_0$$

Event Horizon

Schwarzschild radius

$$R_{Sch} = \frac{2\,GM}{c^2}$$

Singularity

SEVERE CONCEPTUAL & PHYSICAL PROBLEMS

1. Metric Coeffs. Blow Up At $R=R_g=R_s= 2M_0$

2. Change SIGN for $R < R_s$: Time & Space Swap Roles. Explained (!) by the plea ``Coordinate Singularity''. Static Problem Appears Non-Static

3. J of all coordinate transformations singular $R=R_s$

Yet, BHs Concept Got Accepted Because Massive Stars Must Undergo Collapse:

1. White Dwarfs Have Upper Mass Limit: $M_{ch} \sim 1.4\ M_{\odot}$ (Chandrasekhar Mass)
2. Neutron Stars Have Upper Mass Limit: $M_{ov} \sim 0.8\ M_{\odot}$ (Tol-Opp-Volkoff Mass)
3. Indeed there are Compact Objects Much More Massive Than Such Upper Limits

$$K^{EH} = \frac{12}{\alpha_0^4} = \frac{3}{4M_0^4}$$

Kretschmann Scalar= Norm (square) of Riemann Tensor Appears to be Finite at EH $R=R_s$ under the ASSUMPTION of FINITE M_0

Apparently, in 1939, Oppenheimer & Snyder Showed GR Collapse → EH, BH

In the 1970s, Hawking & Penrose Formulated ``SINGULARITY THEOREMS''

Dirac, Proc. Roy. Soc., A270, 354-356 (1962)

``The mathematicians can go beyond this Schwarzschild Radius and get inside, but I would maintain that this inside region is not physical space… so I feel that the space inside R<R_s must belong to a different universe and should not be taken into account in any physical theory.''

Padmanabhan, PLA, 136, 203 (1989)

Statistical Density of States of Gas Cloud in a Spherical Box: E=Energy: r_b= Outer Radius

$$g(E) = 16\pi^2 E^2 \frac{(2M)^4}{r_b - 2M}$$

g→∞ If r_b → R_s : Physical Singularity

Mitra, Non-occurrence of Trapped Surfaces & BHs …, FPL, 13, 543, 2000
Mitra, On the Final State of Spherical Grav. Collapse, FPL, 15, 439, 2002

Irrespective of the coordinate system used, the TIMELIKE worldline of a test particle Would tend to be LIGHTLIKE if R→ R_s : Physical Speed v→ c (in any coordinate)

Kiselev, Logunov, Mestvirishvili, Theor. Math. Phys, 164, 972-975 (2010)
For both Hilbert & Kerr BHs, v→c for test particle as R→R_s

Accel. of a Test Particle Blows Up if R→R_s :
Accel. Would Become IMAGINARY below EH!!!

$$a = \sqrt{a^i a_i} = \frac{GM}{R^2} \frac{1}{\sqrt{1 - R_s/R}}$$

IS IT TRUE THAT ``Event Horizon" CAN NOT BE DETECTED AT ALL?

Karlhede, Lindstorm & Aman, GRG, 14, 569-571 (1982)

$$S = R^{ijkl;m} R_{ijkl;m} = 180 \left(\frac{R_s^2}{R^6} \right) \left(1 - \frac{R_s}{R} \right); S^{-1} \to \infty; \; R \to R_s$$

This shows that a Free Falling Observer Can very Well Detect the EH by noting the change of sign of S; and EH is a PHYSICAL SINGULARITY because $S^{-1} = \infty$. Such SINGULARITY Happens for all BHs: Kerr, R-N....All Horizons.

So BHs and EHs Must Not Occur in GR if it is a correct physical theory. HOW

Abrams, Can. J. Phys, 67, 919 (1989) Highlighted the Original Schwarzschild Solution

$$ds^2 = (1 - \alpha_0/R)dT^2 - (1 - \alpha_0/R)^{-1}dR^2 - R^2 d\Omega^2; \; but \; R^3 = r^3 + \alpha_0^3$$

Now, the Particle is at r=0 and NOT at R=0. The EH $R=2M_0$ now corresponds to the Location of the Particle, and Metric Singularies Appear Natural
Loinger, Antoci ....Crothers Insisted on This Approach: Droste(1916), Brillouin (1923)

But the Area of the POINT PARTICLE: A = 4 π $(2M_0)^2$ Geom. Non-sense **if $M_0 > 0$**
This also does not explain why K^{EH} is Finite at the Location of the Singularity if $M_0 > 0$
Exact Kepler's Law Does Not Follow.

The CONUNDRUM CAN BE RESOLVED if FOR A ``POINT PARTICLE'' iff $M_0=0$!
This would mean BHs must have unique Gravitational Mass $M_0=0$.

Contract Einstein Equation : $R=-8\pi\ T$
But Energy-Mom. Tensor of a ``Point Particle'' Must Contain Dirac $-\delta$
Ref: F.R. Tangherlini, PRL, Vol. 6, 147 (1961)

$R= - 4\ M_0\ G\delta(0)/R^2$: R=0
In Order That $R=0$, A ``Point Particle'' Must Have $M_0=0$ Mitra, J. Math. Phys. 50, 2009
 Recall: Arnowitt, Deser & Misner, PRL, 4(7), 375 (1960):

Dressed Mass of a Particle with Radius ε : $2\sqrt{(8\pi\ m_{bare}\ \varepsilon)}$ →0as ε→0

---------- EXACT PROOF THAT $M_0=0$ FOR A Hilbert/Schwarzschild BH----
Consider Transformation of BH Metric From Hilbert to Eddington Finklestein Coordinate

$g' = J^2\ g$: g= Metric Det, J= Jacobian, It is because of this: dA= dx dy = r dr dϕ

This leads to: $\alpha_0=2M_0=0$ (Mitra, J. Math. Phys. 50, 042502, 2009) arXiv:0904.4754

What This Means is That While Mass of a Body With Finite Radius R_b is of course Finite
$M_0 = \lim M\ (R_b →0) =0$

Schwarzschild Singularity

Luis Bel

Laboratoire de Physique Théorique associé au C.N.R.S., Institut H. Poincaré, Paris

A new point of view is presented for which the Schwarzschild singularity becomes a real point singularity on which the sources of Schwarzschild's exterior solution are localized.

REALITY OF THE SCHWARZSCHILD SINGULARITY*

Allen I. Janis, Ezra T. Newman, and Jeffrey Winicour†
University of Pittsburgh, Pittsburgh, Pennsylvania

A spherically symmetric solution of the Einstein equations is presented that coincides with the exterior ($\gamma > 2m$) Schwarzschild solution, but where the Schwarzschild "sphere" becomes a point singularity. The possible relevance of this solution to the question of gravitational collapse is discussed.

Most Crucial Assumption Behind Singularity Theorems: ``Trapped Surfaces"

A. Mitra ``Quantum information paradox: Real or fictitious?" Pramana, 73, 615 (2009)

In order that TIMELIKE worldlines of the fluid remain TIMELIKE: $2M/R < 1$

If R->0, one must have M→0 (positivity of mass)

But How Does It Happen? What Happens During Gravitational Collapse?

1. ``Why gravitational contraction must be accompanied by emission of radiation in both Newtonian and Einstein gravity", A. Mitra, PRD 74, 024010 (2006)
2. ``Sources of stellar energy, Einstein Eddington timescale of gravitational contraction and eternally collapsing objects", A. Mitra, New Astronomy, 12, 146 (2006)
3. ``A generic relation between baryonic and radiative energy densities of stars"
A. Mitra, MNRAS Lett. 367, L66-68 (2006); (arXiv:gr-qc/0601025)

$Z = (1-2M/R)^{-1/2} -1$; Surface Gravitational Redshift of the Contracting Star

$\rho_r /\rho_m \sim z$: If radiation would come out through perfect diffusion

Because of trapping & Diffusion, a photon takes 1000s yr to emerge from Sun

4. ``Radiation pressure supported stars in Einstein gravity: eternally collapsing objects", A. Mitra, MNRAS, 369, 492 (2006); arXiv:gr-qc/0603055

HOW CAN ONE HAVE $M_0=0$? Total Mass Energy Must Be Radiated Out

CAN SUCH A ZERO MASS BH EVER FORM? Note The Fastest Collapse is Free Fall Collapse

For Which Proper Time of Collapse ~ $M_0^{-1/2} = \infty$. **This means continued collapse must be eternal and must result in Eternally Collapsing Object . So all BH Candidates Must Be ECOs.**

Then What About Oppenheimer & Snyder's Proof of BH Formation?

1. ``The Mass of the OS BH: Only Finite Mass Quasi BHs''
A. Mitra & K.K. Singh, Int. J. Mod. Phys. D 22, online June 11, 2013

2. Kruskal Coordinates & Mass of Schwarzschild Black Holes: No Finite Mass Black Hole at All,
A. Mitra, Int. J. A&A, 2, 236-248 (2013)

3. ``The fallacy of Oppenheimer Snyder collapse: no general relativistic collapse at all, no black hole, no physical singularity'', A. Mitra, Astrophys. Sp. Sc., 332, 43-48 (2011)

WHAT ABOUT SINGULARITY THEOREMS?

1. ``Does pressure increase or decrease active gravitational mass density''? Answer : NO.
 A. Mitra, Phys. Lett. B 685, 8-11 (2010)

2. ``Does Pressure Accentuate General Relativistic Gravitational Collapse and Formation of
   Trapped Surfaces'?'' Answer: NO, A. Mitra, IJMPD 22, 1350021 (2013)

Photon sphere $1+z=\sqrt{3}$

Schwarzschild radius

singularity

event horizon
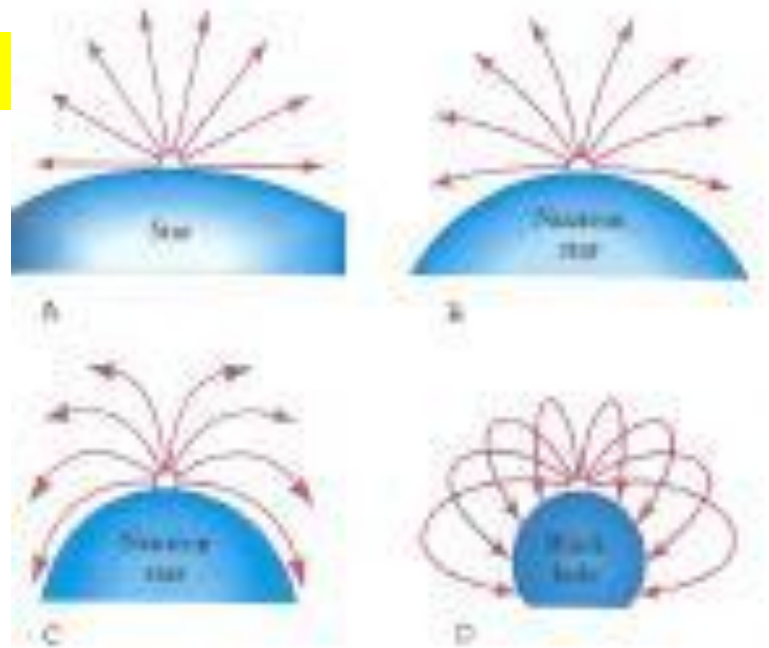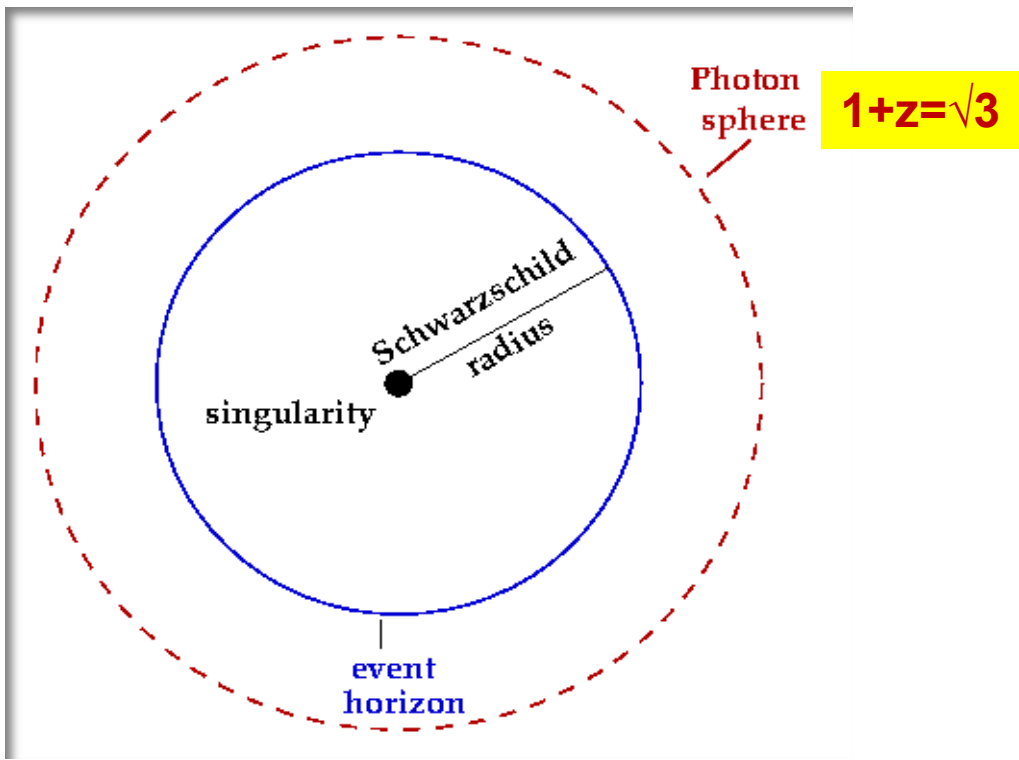
BH Formation: z→∞, and for z>>1, Outward Radiation Force = Inward Pull of Gravity:
EDDINGTON LUMINOSITY:
At this large z, the Mass-Energy Gets Dominated by Radiation: A Ball of Plasma

$$T = \left(\frac{3c^4}{8\pi aG}\right)^{1/4} R_s^{-1/2} \approx 600 \left(\frac{M}{M_\odot}\right)^{-1/2} \text{ MeV}$$

Stellar Mass BH Candidates Are Balls of Quark Gluon Plasma

Mitra & Glendenning, ``Likely Formation of GR Radiation Pressure Supported Stars: ECOs,'' MNRAS Lett. 404, L50-54 (2010); arXiv.1003.3518

CAN THERE BE FINITE MASS SPINNING (KERR) BHs?

1. A. Mitra ``Why the astrophysical Black Hole Candidates may not be black holes at all''; arXiv:astro-ph/0409049

Connect original Kerr Metric & Its Boyer-Lindquist Form: $g'=J^2 g \rightarrow a=M=0$

CAN FICTIOUS BHS REALLY EXPLAIN HIGH ENERGY ASTROPHYSICS? NO!

Membrane Paradigm is Profound Academic Delusion: Unlike Pulsars, White Dwarfs, Stars, BHs (even charged ones) Have No SOURCE of Free Charge, and No Current Can emerge either from the SINGULARITY or from Event Horizon.

2. ``Why No Energy Can Be Extracted From Rotating Kerr BHs''
Mitra & Krori, Journal of Cosmology, 17, 7064 (2011)

Magnetic Flux Get Approx. Frozen in Perfect Plasma: $BR^2 =$ Constant
ECOs$\rightarrow$ Magnetospheric ECOs (MECOs)

Spinning MECOs behave like ultra-relativistic pulsars

Also, even a non-spinning MECO, a ball of strongly magnetized plasma is vulnerable to unpredictable eruptions like Solar Flares, Coronal Mass Ejections, Super Flares causing injection of plasma around. So BHCXBs are much more violent than NSXBs.

Sun is hot PLASMA = Free Electrons, Protons, Ions + MAGNETIC FIELD

Rearrangement of Magnetic Fields: NORTH + SOUTH POLE → SOLAR FLARE Charged Particles are EJECTED by FLARE

COSMIC EXPLOSIONS

2002-Apr-21
00:43:09

1. ``Evidence For INTRINSIC Magnetic Field in Black Hole Candidates''
Robertson & Leiter, Astrophysical J. 565, 447 (2002) (astro-ph/0102381)

2. On Intrinsic Magnetic Moments in Black Hole Candidates
Robertson & Leiter, Astrophysical J. 596, L203; (astro-ph/0310078)

3. ``On the origin of the universal radio-X-ray luminosity correlation in black hole candidates'',
Robertson & Leiter, MNRAS 350, 1391 (2004); (astro-ph/0402445)

4. ``Observations Supporting the Existence of an Intrinsic Magnetic Moment inside the Central Compact Object within the Quasar Q0957+561''
Schild, Leiter, Robertson, Astronomical Journal, 132, 420 (2006); astro-ph/0505518

5. ``Black Hole or MECO: Decided by a thin Luminous Ring Structure Deep Within Quasar Q0957+561''
Schild & Leiter, Journal of Cosmology, 6, 1400 (2010)

6. ``Does Sgr A* Have an Event Horizon or a Magnetic Moment?''
Robertson & Leiter, Journal of Cosmology, 6, 1438 (2010)

7. ``Discovery of universal outflow structures above and below the accretion disc plane in radio-quiet quasars''
Lovegrove, Schild & Leiter, MNRAS 412, 2631 (2011)

DIRECT PROOF: 10 G Magnetic Field Near The Inner Radius of Acc. Disk
8. ``Magnetic and Electric Fields around the Black Hole in Cyg X-1''
Gnedin et al. astro-ph/0304158:

Press Release

New Picture of Quasar Emerges

Cambridge, MA - In the distant, young universe, quasars shine with a brilliance unmatched by anything in the local cosmos. Although they appear starlike in optical telescopes, quasars are actually the bright centers of galaxies located billions of light-years from Earth.

"We don't call this object a black hole because we have found evidence that it contains an internally anchored magnetic field that penetrates right through the surface of the collapsed central object, and that interacts with the quasar environment," commented Schild.

"Our finding challenges the accepted view of black holes," said Leiter. "We've even proposed a new name for them - Magnetospheric Eternally Collapsing Objects, or MECOs," a variant of the name **first coined by Indian astrophysicist Abhas Mitra in 1998.**

Mysterious quasar casts doubt on black holes

•18:21 27 July 2006 by **David Shiga**

"A novel alternative to black hole theory has been bolstered by observations of an object in the distant universe, researchers say. If their interpretation is correct, it might mean black holes do not exist and are in fact bizarre and compact balls of plasma called MECOs."

Black holes 'do not exist'

NEW TERM COINED For: QUASI BLACK HOLEs: "DARK ENERGY STAR"

No More Black Holes? Science Now, June 27, 2007
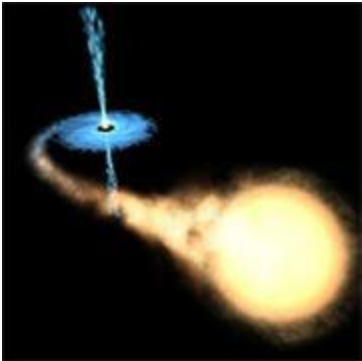
Hide and seek.

New calculations suggest that black holes, like the one in this artist's depiction, might not exist in the universe.

A New Term ``Quasi Black Holes'' got coined to represent essentially ECOs!

Narlikar & Padmanabhan: Foundations of Physics, 18, 659 (1988):

``It is shown that inconsistencies arise when one looks upon the Sch. Sol. as the space time arising from the point singularity.. It is suggested that problems related to the source could be avoided if the EH did not form and universe contained only Quasi BHs''

Ignored Comments of Oppenheimer & Snyder, Phys. Rev. 456, 1939:

"Physically such a singularity would mean that the expressions used for the energy-momentum tensor does not take into account some essential physical fact which would really smooth the singularity out. Further, a star in its early stages of development would not possess a singular density or pressure, it is impossible for a singularity to develop in a finite time.'':
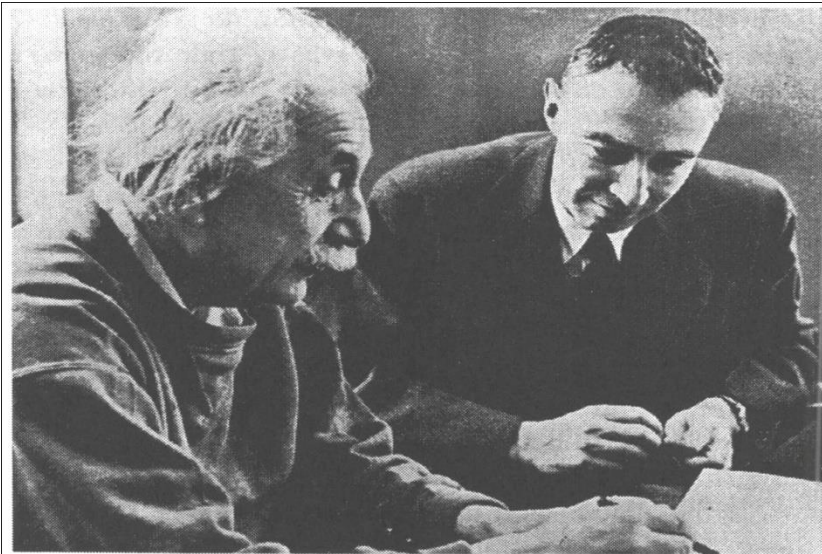
Oppenheimer (2013): Sir You were RIGHT!
No True Black Holes: Got Misled by
Hilbert Sol. of Massenpunkt
Had no idea about Edd. Lumin:
Now Everything Falls in Place:
Just Ultra Compact Quasistatic
Balls of Plasma:

Thank You All