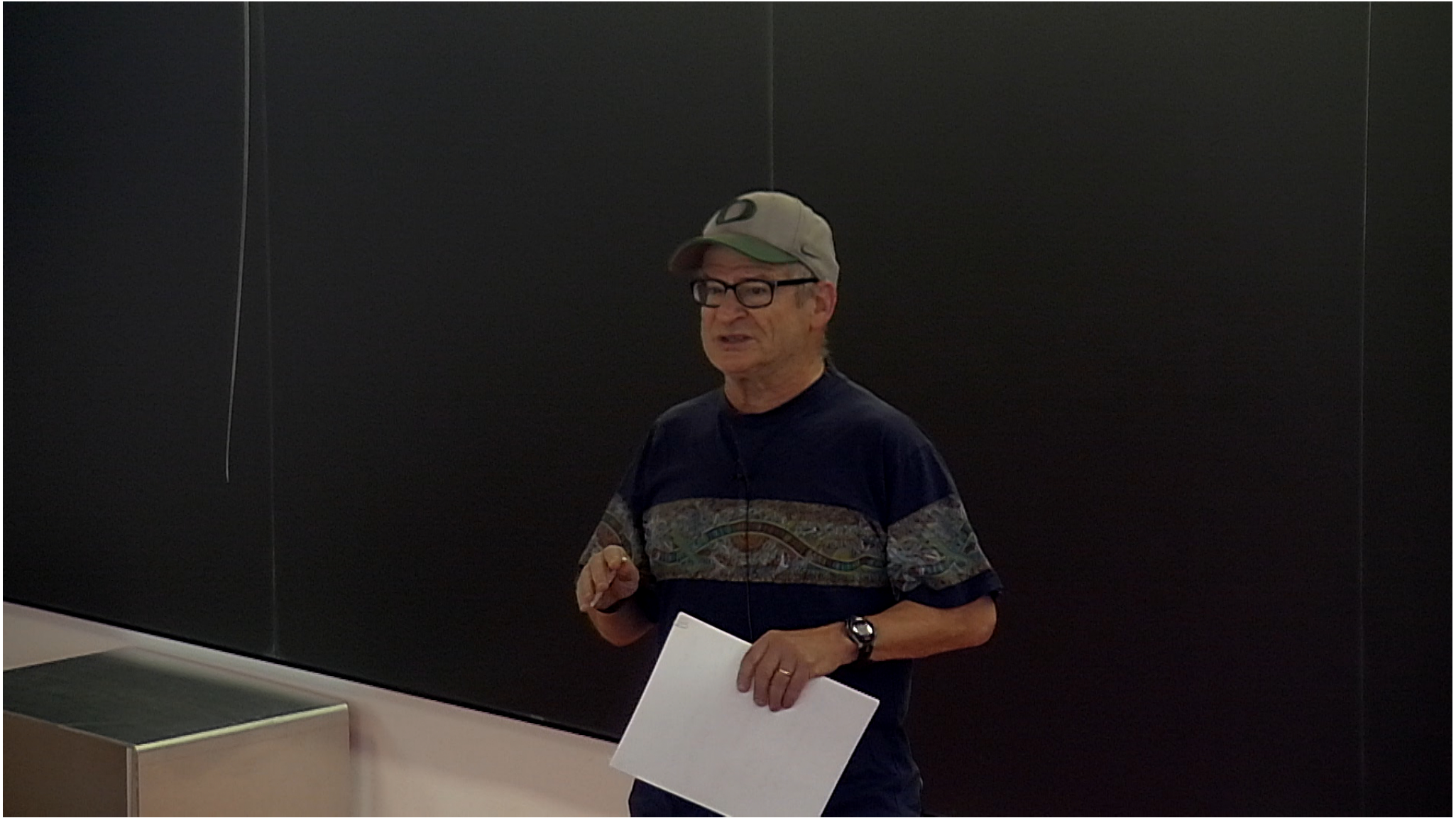


Title: What we know and don't know about solutions to the Einstein Constraint Equations

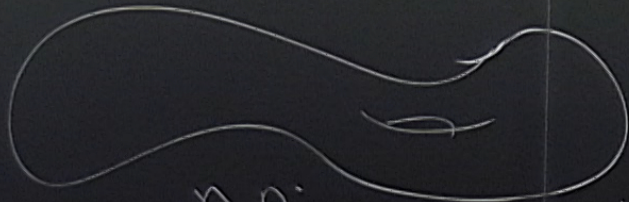
Date: May 16, 2017 09:30 AM

URL: <http://pirsa.org/17050048>

Abstract:



Initial Data Set



Σ^3

- g Riemannian metric
- K sym tensor
- f nongravit
- Λ

$$R(x) - K K + (tr K)^2 = \rho(\psi) + \Lambda$$

$$D \cdot K - D(tr K) = J(\psi)$$

Space of Sol's

choose Σ^3

$C(\Sigma^3)$

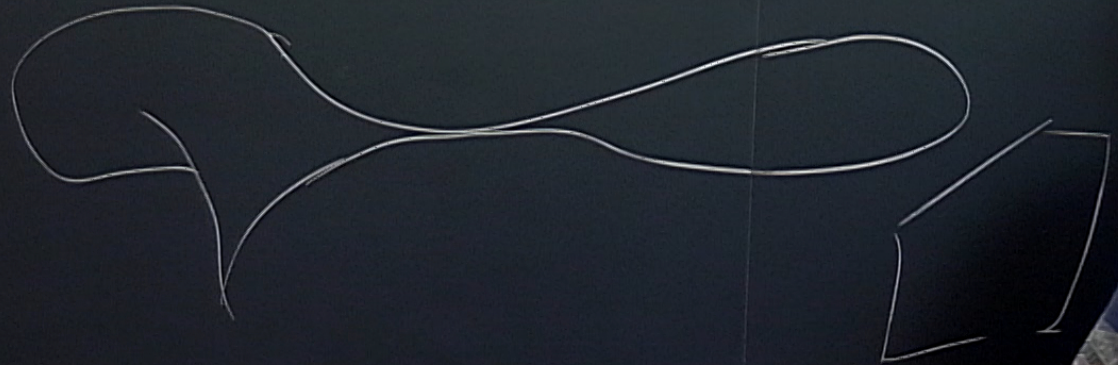
$$k^2 + (\ln k)^2 = \rho(\psi) + 1$$

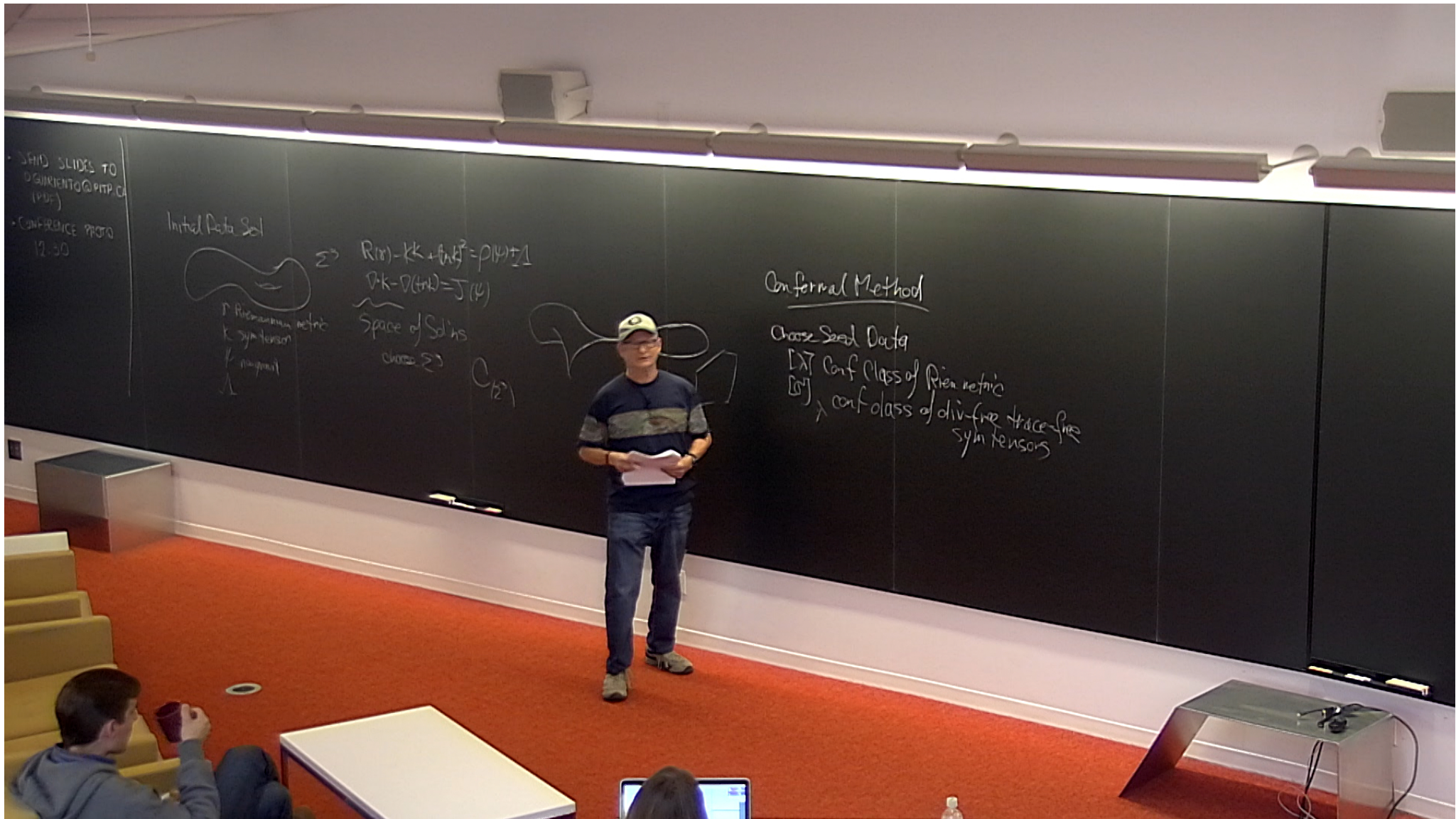
$$\rho(\ln k) = \psi(\psi)$$

of Sol'ns

Σ^3

$C(\mathbb{R}^3)$





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CONFERENCE PROG
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Initial Data Set

Σ
Riemannian metric
 K sym tensor
 K potential

$$R(\Sigma) - K^2 + (\text{tr} K)^2 = \rho(\Sigma) + 1$$
$$D^*K - D(\text{tr} K) = J(\Sigma)$$

Space of Solns
class Σ

$C^{1,2}$

Conformal Method

Choose Seed Data

- [X] Conf Class of Riem metric
- [Y] conf class of div-free trace-free sym tensors

Conformal Method

Choose Seed Data

[λ] Conf Class of Riemannic

[σ] conf class of div-free trace-free
sym tensors

η fctn.

Solv

$$LW = D_{ab} W_b - D_a W$$

Solve Conf Constr Fg's

$$(D_a L)W = \phi^6 \nabla_a \nabla^a \phi$$

$$\Delta \phi = R_{\lambda} \phi - (\alpha +$$

$$LW) \phi^{-7} + \nabla^2 \phi^5$$

$$\Rightarrow \gamma_{ab} = \phi^4 \lambda_{ab}$$

$$K_{cd} = \phi^{-2} (\partial_{cd} + L W_{cd}) + \phi^4 \lambda_{ab} T$$

Soln

$$\gamma^2 \phi^{-7} + \gamma^2 \phi^5$$

Determine which
seed data sets
lead to solving

Cousins of the Conf Method

Can formal Thin Sandwich

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PHOTO

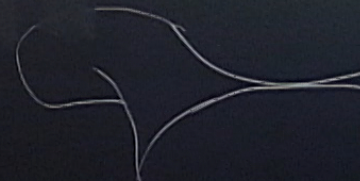
Determine which
seed data sets
lead to solns

Cousins of the Conf Method

Conformal Thin Sandwich

⇒ Conformally Covariant

$$\begin{array}{ccc} \downarrow & \theta^4 \lambda & \\ \downarrow & \theta^2 \nu & \\ \downarrow & \theta & \\ \downarrow & \theta^{-6} \nu & \end{array}$$



Pre-Millennial Results
 Conf Method Works for CMC
 ($\Delta \leq 0$)

Maxw Fluids

$$\langle W |_{ab} = D_{(a} W_{b)} = D \cdot W$$

Solve Conf Constr Fg's

$$(\nabla \cdot \underline{L}) W = \phi^6 \nabla \cdot \underline{T} \quad \text{Ex B}$$

$$\Delta \phi = R_{\downarrow} \phi - (\alpha + \frac{1}{2}) \langle W |^2 \phi^7 + \nabla^2 \phi^5$$

solve for
 ϕ, W

str fgs

$\nabla \times E = -\dot{B}$

$(\partial_t + \frac{1}{2l}) \psi = \phi^{-7} + \tau^2 \phi^5$

Closed Σ^3

	$\sigma \equiv 0$ $\tau = 0$	$\sigma \neq 0$ $\tau = 0$	$\sigma \equiv 0$ $\tau \neq 0$	$\sigma \neq 0$ $\tau \neq 0$
αy^+	N	Y	N	Y
αy^c	Y*	N	N	Y
αy^-	N	N	Y	Y

$(dx + Mat)$

Doesn't always

$\Sigma^3 = S^3$

end m

Closed Σ^3

	$\sigma \equiv 0$ $\tau = 0$	$\sigma \neq 0$ $\tau = 0$	$\sigma \equiv 0$ $\tau \neq 0$	$\sigma \neq 0$ $\tau \neq 0$
α_j^+	N	Y	N	Y
α_j^c	Y*	N	N	Y
α_j^-	N	N	Y	Y

+ $\tau^2 \phi^5$

\bar{E}

	$\sigma \equiv 0$ $\tau = 0$	$\sigma \neq 0$ $\tau = 0$
α_j^+	Y	Y
α_j^c	N	N
α_j^-	N	N

$(L)W=0$



Closed Σ^3

	$\sigma \equiv 0$ $\tau = 0$	$\sigma \neq 0$ $\tau = 0$	$\sigma \equiv 0$ $\tau \neq 0$	$\sigma \neq 0$ $\tau \neq 0$
α_j^+	N	Y	N	Y
α_j^*	Y	N	N	Y
α_j^-	N	N	Y	Y

A^+

	$\sigma \equiv 0$ $\tau = 0$	$\sigma \neq 0$ $\tau = 0$
α_j^+	Y	Y
α_j^*	N	N
α_j^-	N	N

A^-

	$\sigma \equiv 0$ $\tau = 1$	$\sigma \neq 0$ $\tau = 1$
α_j^-	Y	Y

$\phi > 0$
 $\phi = \emptyset$

Determine which
seed data sets
lead to solving

$$\frac{|D_9|}{\alpha} = \text{small}$$

Drift

Determine which
seed data sets
lead to solns

Conformal KV Field

Far from CMC
or
CMC with scalar fields
 $V(\phi) > 0$
 $\Delta > 0$

Res
d V

he which
data sets
to solns



Special
Param
101 | No
Soln



