

COSMOLOGICAL M THEORY, SUSY BREAKING, AND THE COSMOLOGICAL CONSTANT

T. Banks

Strings 2000 - July 13, 2000

TOWARDS A COSMOLOGICAL M THEORY

Associate Hilbert Space \mathcal{H}_i With Causal Past of n Points

Dimension Given by BHFSB Entropy of Holo Screen

$$\text{Causality: } \mathcal{H}_i = \mathcal{O}_{ij} \otimes \mathcal{D}_{ij}$$

$$U_{ij} = U_{ji}^{-1} : \mathcal{O}_{ij} \rightarrow \mathcal{O}_{ij}$$

Triple Overlap Condition

$$\text{Time Evolution: } \mathcal{H}_{J_n}^n \subseteq \mathcal{H}_{J_{n+1}}^{n+1}.$$

$$T : \Psi_{J_n}^n \rightarrow \Psi_{J_{n+1}}^{n+1}$$

Strong Constraint on T and Causal Structure

Conjecture: Large Dim \mathcal{H}_i : Einstein Eqns.

Spacetime Dim. : Fermionic Variables and Twistors - No Time

AsDS SPACES AND Λ

AsDS : $\mathcal{H}_I^n \rightarrow \mathcal{H}$ as $n \rightarrow \infty$

$$\ln \dim \mathcal{H} = M_P^D / \Lambda$$

Black Hole Argument

$\Rightarrow \Lambda$ is an *Input* Parameter

Solves Problem of Exact SUSY Vacua

COSMOLOGICAL SUSY BREAKING?

AsDS space Automatically Breaks SUSY

Classical Gravity Approx.: $M_{SUSY} \sim \Lambda^{1/4}$ (NFT)

Approximate Nature of This Eqn.

$\Lambda \rightarrow 0$ Critical Limit, Large QG Fluctuations

UV/IR Correspondence and Black Hole Entropy

TB, Fischler: Ultimate SD Cutoff is BH Formation

$$\int dM e^{S(M) - (M/2\pi R_{DS} M_P^2)}$$

$$S(M) \sim (M/M_P)^{\frac{(D-2)}{(D-3)}} < S_{DS}$$

Dominated by Largest M: UV/IR \Rightarrow ? Thermodynamic Calculation

$$\text{Hope: } M_{SUSY} \sim M_P (\Lambda/M_P^4)^{1/8}$$

SCHERK-SCHWARZ SUSY BREAKING IN NC FIELD THEORY

W. Fischler + tb

4D WZ Model With SS B.C. on a Circle

Commutative: $E_{vac} \sim \frac{1}{R^4}$; Finite

NC : $E_{vac} = \infty$ at Two Loops

UV/IR: Only Boson Has Zero Mode

Similar Results for Disp. Rel. and $N = 4$ SYM

Std. Resummations Do Not Remove Divergence

Large N WZ?, But UV Trivial???

Makes Point that UV/IR Enhances
SUSY Breaking by Large Scale Geometry

IMPLICATIONS FOR PHENOMENOLOGY

$\Lambda \rightarrow 0 \Rightarrow$ SUSY Vacuum With No Moduli

Probably $\Rightarrow N = 1, D = 4$ at Enhanced Discrete
R Symmetry Point *c.f. Dine*

Approx. Flavor Independence of SUSY Breaking
e.g. From Discrete Flavor Broken at Low Energy

Low Energy SUGRA Lagrangian: ~~SUSY~~ by Volkov-Akulov Goldstino
Relation Between M_{SUSY} and Λ Set By Hand

Most SUSY Violating Parameters: Details of BH Microphysics ?
But Symmetries Plus Thermodynamic Nature of
Black Holes May Determine Some Aspects

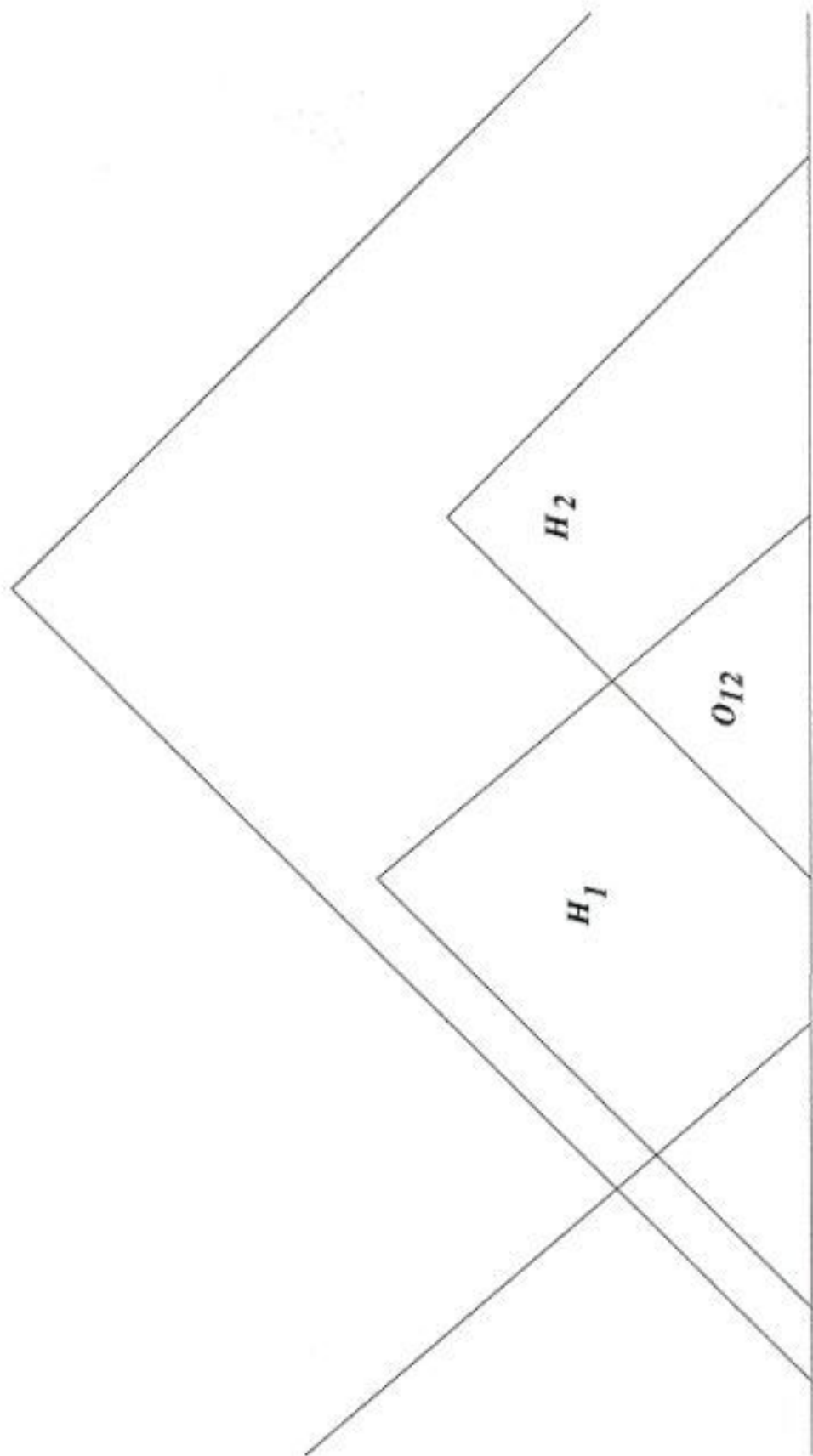
CONCLUSIONS

1. New Paradigm for SUSY Breaking
2. No SUSY Breaking in Flat Space
3. Critical Calculation: Exponent $1/8$: Maybe *via* Semiclassical GR
4. NC Field Theory: Toy Model of Relation Between SUSY Breaking and UV/IR Relations
5. Cosmological Formulation of M Theory Intriguing - Needs Work

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BUILDING GEOMETRY FROM HILBERT SPACES AND THE HOLOGRAPHIC PRINCIPLE



DE SITTER BLACK HOLE

$$ds^2 = -dt^2 \left(1 - \frac{2M}{r} - \frac{r^2}{R^2}\right) \\ + dr^2 \left(1 - \frac{2M}{r} - \frac{r^2}{R^2}\right)^{-1} \\ + r^2 d\Omega^2$$

$$R_{\text{Schwarzschild}} < R_{\text{DS}} \equiv R$$

INFINITE BH SPECTRUM
OF AF SPACE CUTOFF
BY DS GEOMETRY

SUGRA (CLASSICAL) :

$$V = e^K [K^{i\bar{j}} F_i F_{\bar{j}} - 3|W|^2]$$

GENERICALLY

$$M_{\text{SUSY}} \sim \Lambda^{1/4}$$

$$\text{QFT often} \rightarrow \Lambda^{1/2}$$

(PLANCK UNITS)

EXPT'L BOUNDS

$$\underline{M_{\text{SUSY}}} \gtrsim \underline{\Lambda^{1/8}}$$

THE NON COMMUTATIVE WESS-ZUMINO MODEL WITH SCHERK-SCHWARZ COMPACTIFICATION

$$\mathcal{L} = \int d^4\theta \bar{\phi}\phi + \int d^2\theta \phi * \phi * \phi + \text{h.c.}$$

$$\phi(x_3 + 2\pi, \theta) = \phi(x_3, -\theta)$$

$$[x^2, *x^3] = iH$$

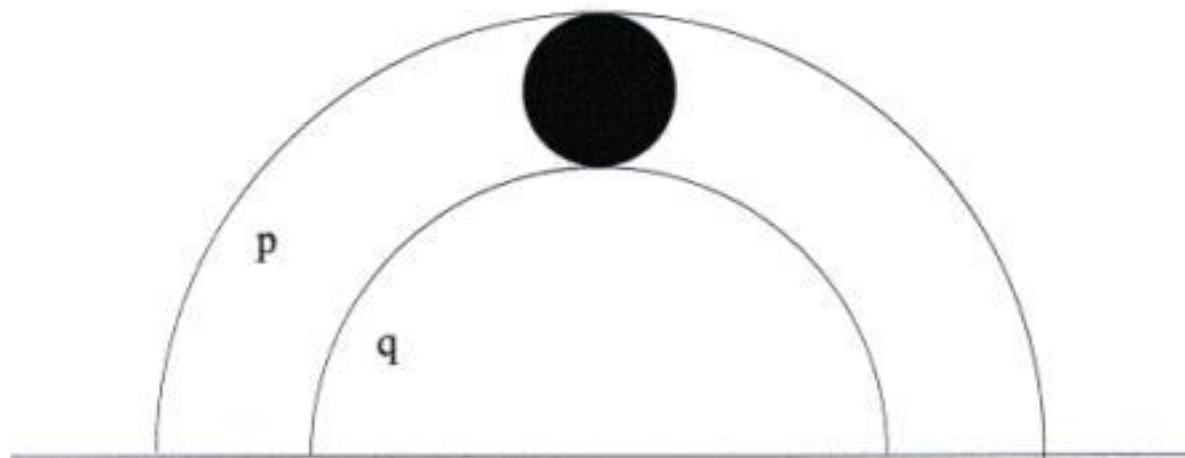
VAC. EN. : NON PLANAR 2 LOOP

$$8 + \text{⊙} + \text{⊙} = \frac{1}{R^4} \epsilon$$

Similar results
 $\Delta E_B - \Delta E_F$

0 N.C. SUSY
 ∞ N.C. ~~SUSY~~

$N=4$ MSYM



VIRTUAL BLACK HOLE CONTRIBUTION TO SELF ENERGY