

5 WISHES

FOR

NEXT

5

YEARS



Hey what's the present in there?

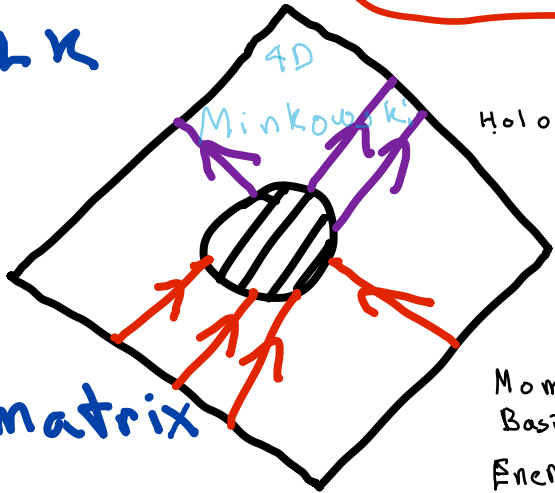


Strings 2021  
Discussion  
Brazil  
Andy Strominger

For those who missed Sabrina's excellent review!

# Basic Idea

BULK

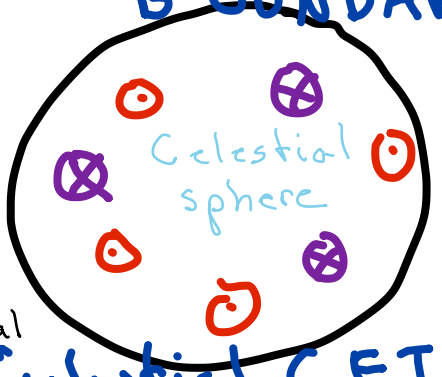


S-matrix

Holographic Duality

=

BOUNDARY



Celestial CFT correlator

Momentum Basis  $\Leftrightarrow$  Conformal Basis  
 Energy  $\Leftrightarrow$  Boost weight

$SL(2, \mathbb{C})$  Lorentz = global 2D conformal  
 Superrotations = local 2D conformal  
 Supertranslations  $\mathcal{O}_{\Delta}(z, \bar{z}) \rightarrow \mathcal{O}_{\Delta+1}(z, \bar{z})!$   
 ... more ...

I

BOTTOM UP

Find all symmetries of known laws of physics - GR + S.M. - in  $\Lambda=0$  approx

- includes antipod ( $BMS^+$  &  $BMS^-$ ) + much more
- we theorists go yes behind on our homework
- $\exists$  many equiv formalisms, celestial seems v powerful  $W_{1+\infty}$ ! (2 weeks ago)
- step 0 for flat holography

2

BOTTOM UP

Predict & experimentally verify  
 towers of soft conservation laws

Gravitational memory

Grav. spin memory

Color memory

⋮

more

⋮

Electromagnetic memory

More theorist homework!

LIGO

Nichols LISA? > Sycs

FIC Ball Pate Rackeise

AS Venugopalan

Bier Garfinkle

Pasterski

Susskind

Weiss

3

TOP DOWNS

Construct top-down example of celestial holography from string theory.

- BFSS?

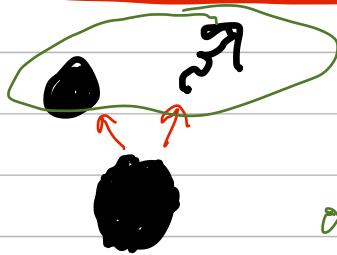
-  $N=2$  string?

Follow methodology of Gaiotto, Kutasov, Seiberg  
Gopakumar, Gaberdiel  
string WS  $\rightarrow$  boundary CFT

4

Bottom up

Characterize constraints  
from  $\infty$  soft conservation laws  
on int. flow in/out of black  
holes



conservation laws  
 $\Rightarrow$  quantum  
correlation  
 $\infty$  cons. laws  $\Rightarrow$  ?  
soft hair?

Awaits complete understanding of  
symm / cons. laws

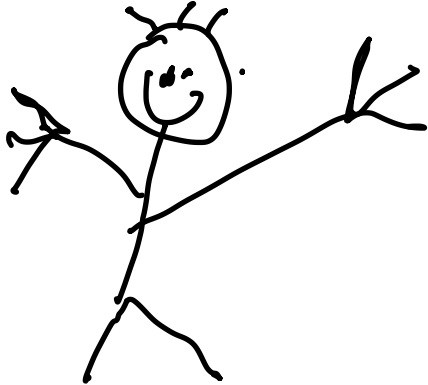
5

Bottom up ... to top?

Find general analytic form of graviton 4pt <sup>celestial</sup> scattering consistent w/ unitarity, soft symmetries, locality, crossing ...

- highly constrained celestial symmetries
- good UV "baked" in, recent work locality  
EhanyblausugHuangLi
- back to strings?

Please ask  
questions / comments  
of any kind, but  
save for after Tom.



Thank  
you for  
listening!

