

beginning of Bond's TIME

Bond@CITA @KITP, 03.01.2023

Snapshots of Copernicus@550, b 02.19.1473 Poland; & my futures-tale-ending it:
how we CITAzens of Cosmic Information Theory & Analysis map the
Interconnected CosmicWeb, *really quantum superWeb*

Copernicus World Congress + Academy
panels, pics, PMs, PIS politicians, prelates
cardinals, the robed, the 5 noble nobels, the
residual *aka the rest of us*

amidst astro: what to do about russia, banks, Torun declaration++

and politics, catholic PIS cf. X, 2 copernican academies, & \$-no\$

and ukraine, and Biden in ukraine, and Biden in warsaw

2023

the pomp & circumstance

February 19

08:30-10.00
10:15-10.30
10:30-10.50
11:00-13.00

Mass at St. Johns' Cathedral and unveiling of the plaque
Laying flowers at the monument to M. Copernicus
Transfer to the Nicolaus Copernicus University (UMK) Auditorium
Celebration of the Nicolaus Copernicus University and the first part of the opening of the Nicolaus Copernicus World Congress (UMK Auditorium)

11:05
11:10
11:20
11:30

The Academic Choir will sing the national anthem
Welcoming of guests by the Rector, Prof. A. Sokala
Address by the Minister of Education and Science, Prof. Przemysław Czarnek
Ceremonial opening of the Nicolaus Copernicus World Congress - Part I
(Rectors: Prof. A. Sokala, Prof. J. Popiel, Prof. J. Przyborowski)

11:45
12:25

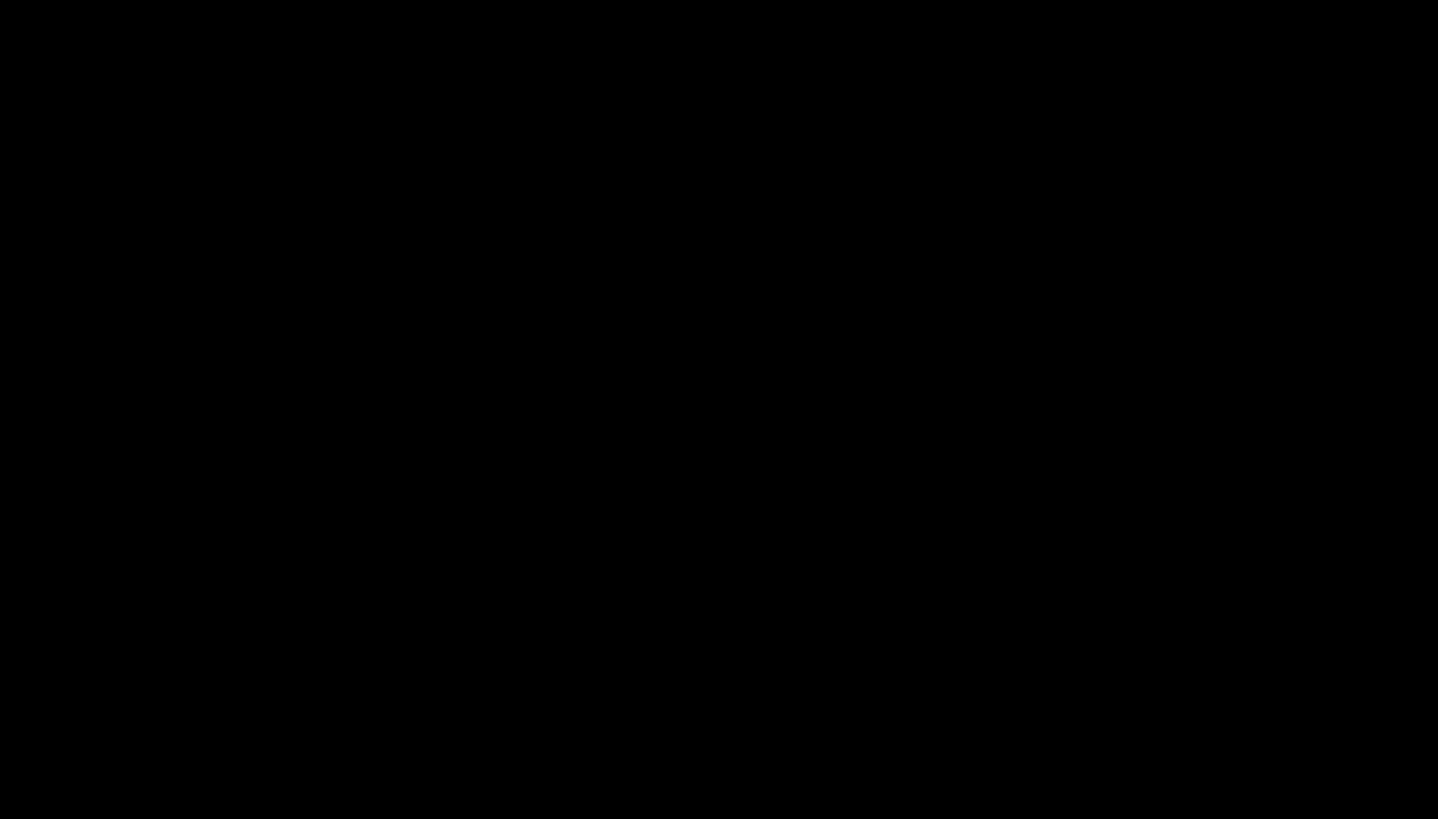
Inaugural lecture by Prof. Jim Peebles

Commemorative speeches:

- KRASP President, Prof. Arkadiusz Mężyk
- Voivode of the Kuyavian-Pomeranian Voivodeship, Mikołaj Bogdanowicz
- Marshal of the Kuyavian-Pomeranian Voivodship, Piotr Calbecki
- Mayor of the City of Toruń, Michał Zaleski

12:40

Closing of the ceremony



12:40	Closing of the ceremony
12.45 - 13.00	Transfer to the Congress Centre Jordanki
12.30	Opening the entrance to the Congress Centre Jordanki
12.30-14:00	Lunch
14:00-16.15	Inauguration of the Nicolaus Copernicus World Congress - Part II - Presentation of the Copernican Awards - Presentation of nominations for Copernican Academy members and for the General Secretary = <i>Kris Gorski</i> - Closing of the inauguration of the Congress
16.15-16.30	Break
16.30-18.00	Polish Science Gala, presentation of the Minister's awards
18.00-18.15	Break
18.15-20.00	Dies Natalis Copernici organized jointly with the District Museum
18.20-18.50	Lecture by Prof. P. James. E. Peebles
18.50-19.20	Lecture by Prof. Michel Mayor
19.20-20.00	Concert by Jakub Orliński
20.00-23.00	Dinner under the auspices of the Minister of Education and Science, Prof. Przemysław Czarnek

2023

February 20

- 08:45
- 08:45-09:50
- 09:50-10:45
- 10:00-11:15

Introducing Nobel Prize Laureates - Day 1

Introducing remarks by Prof. Wojciech M. Rzyżak (Director, Copernicus Astronomical Observatory of the University of Warsaw, Jet Propulsion Laboratory)

Presentations by Nobel Prize Laureates: Prof. Barry C. Barish (Caltech), Prof. Arthur J. McEwen (Queen's University) and Prof. Didier Queloz (University of Cambridge, University of Geneva, ETH Zurich) Panel and Thematic Debate

forever young, dylan
57, 87, 87, 80, 80

AKADEMIA
KOPERNIKAŃSKA

20.02.2023

Dwór Artusa



*science glitterati greetings: Nicolaus Copernicus Academy of Sciences,
Polish Astronomical Society, IAU, ESO, ESA, IYBSSD (sustainable development), CERN,
Astroparticle Physics European Consortium*

2023

February 21

cosmic web-ing

H0 tension was tensionless

Astronomy/Natural Sciences Meeting – Day 2

SESSION Nr. 3 Astronomy/Natural Sciences
Chair – Prof. Nabila Aghanim (Institut d’Astrophysique Spatiale, CNRS, Université Paris Sud) and Prof. Simon D.M. White (Max Planck Institute for Astrophysics, Garching)
„Universa – the Far-side”

Prof. Douglas Scott (University of British Columbia) –
„Testing the Copernican Principle on large scales”

Prof. Anthony Challinor (Director, Kavli Institute for Cosmology, Cambridge) –
„Back-lighting large-scale structure with the cosmic microwave background”

Prof. Benjamin Wandelt (Sorbonne University, Institute Lagrange de Paris) –
„Power beyond power spectra: from cosmic origins to cosmic fate”

Prof. Rien van de Weygaert (Kapteyn Institute, University of Groningen) –
„A catastrophic view of the Cosmic Web”

Prof. Nabila Aghanim (IAS, CNRS, Univ. Paris Sud) –
„The hidden matter, some like it hot”

Prof. Guenther Hasinger (ESA Director of Science) –
„Is Dark Matter made out of Primordial Black Holes”

Prof. Simon D.M. White (MPA, Garching) –
„Prompt cusps and their astrophysical consequences”

Prof. Carlos Frenk (Durham University) –
„A definitive test of LCDM”

Debate: Does the constitutionalism of Western civilisation still exist?

DISPARTSIA
Start Meetings

17.15 – 19.00

Focus Sessions

17.00–19.00

Focus Sessions

17.00–18.00

Focus Sessions

18.00–19.00

CLEJ Awards

20.00–22.30

Open debate of the Chamber of Medical Sciences
Moderator – Prof. Andrzej Dzik

SESSION Nr. 2 Astronomy/Natural Sciences
Chair – Dr. Graca Rocha (Jet Propulsion Laboratory, Pasadena) and
Prof. Marc Kamionkowski (Johns Hopkins University, Baltimore)

Session “Consistency(?) of the Near- and Far- Universe Probes”
Prof. George Efstathiou (University of Cambridge)

Dr. Bruno Leibundgut (ESO, TUM) – “Local H0 without a distance ladder”
Prof. Grzegorz Pietrzyński (CAMK, PAN) – “The Araucaria project. Geometrical distances – the first and most important step toward precise Hubble constant determination”

Dr. Bartłomiej Zginski (CAMK, PAN) – “Precise standard candles – calibrators of SNIa brightness”

Panel discussion:
“Exploration of the Cosmic Microwave Background – the Future”

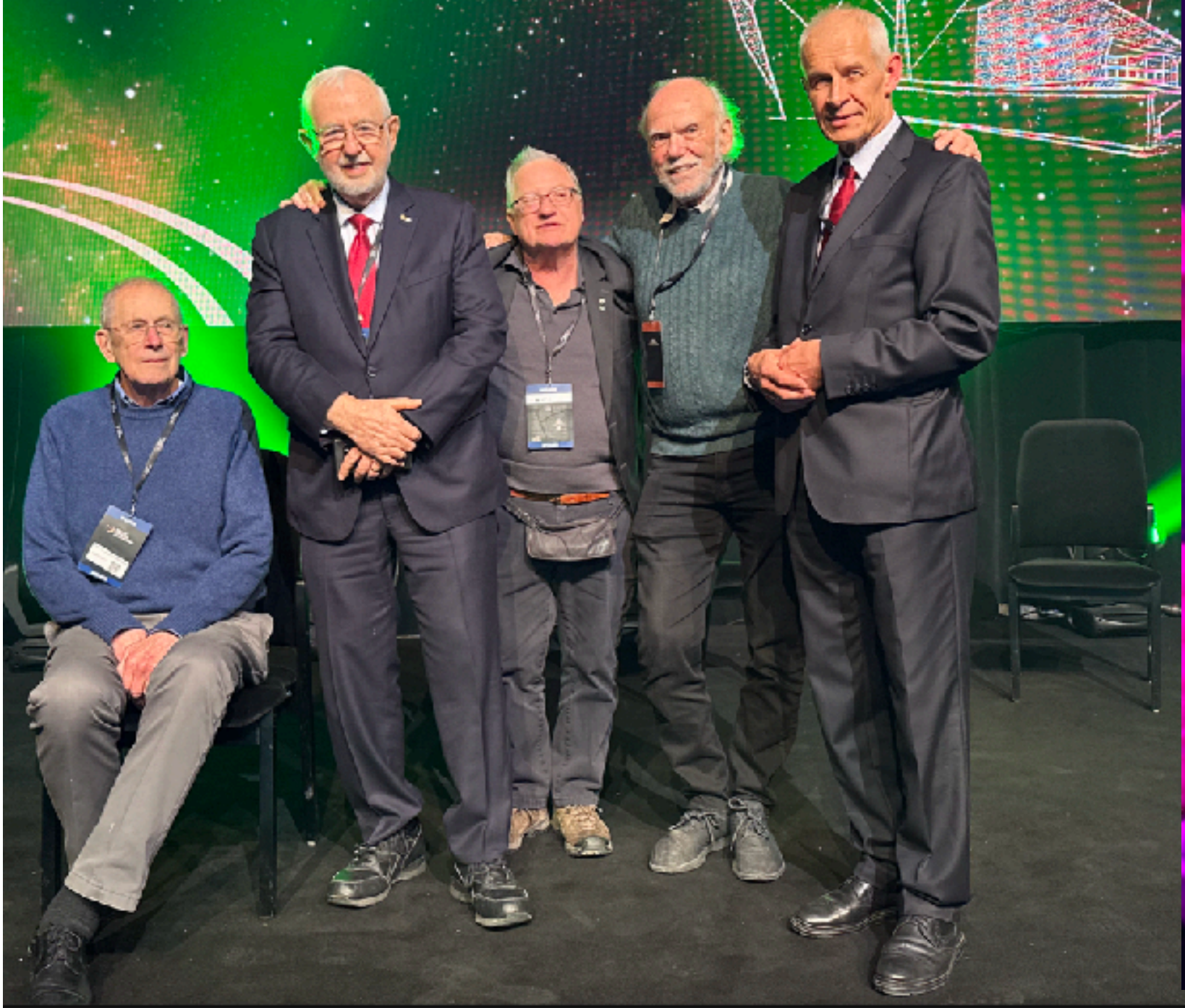
Participants: Prof. John Carlstrom (University of Chicago)

Prof. Masashi Hazumi (High Energy Accelerator Research Organization – KEK, and Kavli IPMU, Tokyo University)

Prof. Lyman Page (Princeton University)
Dr. Charles R. Lawrence (Jet Propulsion Laboratory, Pasadena)
Prof. Rafael Rebolo Lopez (Institute of Astrophysics of the Canary Islands)
Prof. Jens Chluba (University of Manchester)

Dinner under the auspices of Prof. Adam Glasziou,
Governor of Narodowy Bank Polski

does CMB
have a
future?



Essay on the Coinage of Money

As a church **canon**, he collected rents from church-owned lands; secured military defenses; oversaw chapter finances; managed the bakery, brewery, ...

Nicolaus Copernicus



Feb 22 canada+poland celebration of GW ligo virgo kakra (ligo@cita..inc) astroparticle DM SNOlab AstroCent

a polish prof to silk and me and nabila aghanim: looks like you may be unwittingly providing symbolic support for an organisational shift to religious and political control of Polish research infrastructure and to support for an extreme-right Minister of Education and Science

More specifically, under Article 76 of the law of 11 July 2022 establishing Akademia Kopernikańska, spontaneous political demonstrations .. are illegal in Toruń from 72 hours before the World Copernican Congress (PiS) started, through to 48 hours after it ends.



February 21

Hotel Copernicus	15.00-16.30	Signing ceremony of the „Toruń Declaration” Moderator- Prof. Grzegorz Górski
DWÓR ARTUSA	15.00-16.45	Economic Debate „Sources of Poland’s economic success and challenges for the future” Moderator- Prof. Jakub Growiec Prof. Leon Podkaminer (Vienna Institute for International Economic Comparisons) Prof. Cezary Kochalski (Member of the Monetary Policy Council, Poznań University of Economics) Prof. Jacek Kottowski (Deputy Director, Department of Economic Analysis and Research, NBP) Dr Magda Ciżkowicz-Pękała (Deputy Director of the Department of Economic Research and Analysis of the NBP)
Ratusz Staromiejski	16.15 - 17.10	„Impressions and Words of Wisdom for the Future (of, mostly, cosmology ..)” Prof. J. Richard Bond (CITA, Toronto) and Prof. Joseph Silk (Institut d’Astrophysique de Paris, Johns Hopkins University)
DWÓR ARTUSA	17.30-18.30	National Academic Exchange Agency discussion panel “Through academic mobility to strengthening scientific potential - how foreign scholars are changing the Polish scientific world” Moderator- Dr Dawid Kostecki, Director General of Polish National Agency for Academic Exchange Prof. Grzegorz Węgrzyn, Prof. Grzegorz Królczyk, Dr Lynne Bowker, Dr Nicoleta Cinpoes, Dr Munish Kumar Gupta
DWÓR ARTUSA	18.30-19.00	Closing ceremony
DWÓR ARTUSA	18.30-18.45	Speech by the Secretary General of the Nicolaus Copernicus Academy -

*barish to bond after talk:
admire your stream of
consciousness method
- beyond-the-slides,
twas a compliment i think
so let the thought-flood flow*

beginning of Bond's Copernican **TIME**



„Impressions and Words of Wisdom for the Future (of, mostly, cosmology ...)” Prof. J. Richard Bond (CITA, Toronto)
and Prof. Joseph Silk (Institut d’Astrophysique de Paris, Johns Hopkins University)

Gorski to bond & silk, license to sing songs of our choice,

joe silk (80+): dark side of the moon, pink floyd

bond: knock knock knockin on heavens door, dylan

but too: forever young, dylan

final talks,
wishing wisdom,
getting BS

-> So *unbound* bond: CITA = cosmic information theory and analysis

a practitioner of the zen of CITA is a CITAZen,

a CITA mantra is once a CITAZen always a CITAZen

so I invite you all to consider yourselves CITAZens, we analyzers of U

=> CQITA *cosmic* quantum information theory and analysis $\psi = \exp(iS_R - S_I)$



entropic bond S_I = entropy/2 (& its far from equilibrium currents)

coherent bond S_R = phase = action => $2\pi L$ wraps to counts

all cosmology is quantum cosmology,

all structure in the universe is from an entropic (bose-einstein) condensate,

all physics is cosmology, all planets, life too

& all halos are (bose-einstein) condensates, $k < k_{\text{Jeans}}$ hence not just fDM cores.



BSMc Transport from Early U Generation to all Correlated lensed Cosmic Web Probes to entanglement bases

Bond@KITP 23 02.09 A toolkit for CMB and LSS experiments creating websky-ensembles to test BSMc theories on Uweb with

Websky Extragalactic Simulations @mocks.cita.utoronto.ca

MPeakPatches+Hydro+Usims+ coarse-grain halo+field & fine-grain stochastic response functions bias-RG-flows

THEN BBKS, BCEK, B+Myers91,93,96, BKP96 cosmic web @kitp96, BW97 Lya,.. NOW: CITA mini-industry Alvarez, Bond, Stein 2013- 18-20-22 Berger,

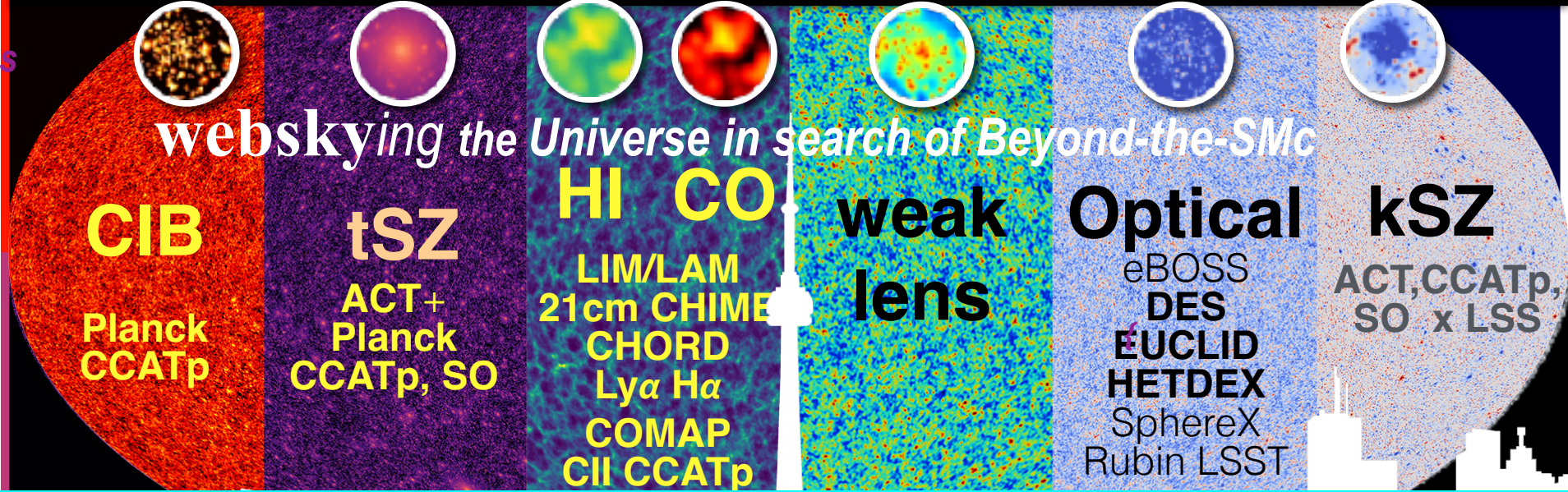
Battaglia, **Togay**, Codis, van Engelen, Motloch **Lokken, Lague, Braden, Morrison, Haider, Huang, Frolov, Carlson**, Keating, Breyse, **Chung**,

Padmanabhan, **Li, Liang, Lahklani, patrick h, bruno, connor, ronan, furen, anita, louis, remi, jason Lee, jaafar, clara, Liang, Murray, Thompson, Pustovoit**

SuperWeb of all fields: XYZT, ϕ^A
Instabilities & Phase Transitions
fission/fusion in deformed vacua
Casimir
=> Intermittent nonGaussian \mathcal{C}
BSMc => 09-23+



need validation $\checkmark\checkmark$ & speed to build (all-sky large-dynamic-range light-cone) ensembles
need all signals to be correlated, 1, 2, 3, .. Npt .. & to be lensed
need End to End mocks for BSMc: nonG ζ, ζ_{isoc} cDE/modG m_{DM} , FuzzyDM, Mnu,..



other BSMc
 $C\nu B$ distortions
Dynamical DE
Coupled DE
funny DM ϕ_{DM}
pnonG pBH +
first *s
VMO ring of fire
> VMBH clusters
82-86, 23-

ψ SR SI CITA = Cosmic Information Theory & Analysis

from SuperWeb simplicity (?) to complex Intermittency in the Cosmic Web
Studying the Cosmic enTanglement Universe=System+Res =Signal+Noise Duals

the Universal story: $U \Rightarrow$ entropy / information currents + phase / action currents (tensors)
coupling duals of collective charges $Q = Q$ -field; eg E/M, P, LSZ, LCIB

Planck, AdvACT, SO, CMB-S4, CCATp, Spider LITEBIRD + SPT, BK, CLASS,.. optical/IR SDSSn, EUCLID, LSST, DES, HSC, DESI, SphereX, WFIRST radio LIM CHIME, HIRAX, COMAP, CHORD, EXCLAIM,.. SKA, HERA, LOFAR, ..

one single vast entangled multi-messenger experiment probing the underlying BSMc to explore with novel statistical analyses

transporting - U from Idea to Reality, beginning of time, thru here & now, to the end of time
simulating - our vast growing enterprise of n-body, gas, feedback, .. in aid of analyzing experimental/observational results
fast all-sky correlated mapping - to be future-informed with AI and ML? ChatGPT? **Websky Extragalactic Simulations @ mocks.cita.utoronto.ca**

the **human component of cosmology**, CITAzens, art of the few on black/white boards, into **large team-ism**, a buzzing hive (queen bee?), hoping for the emergence of coherent-prominence signals from the noise buzz

early Universe
Cosmic SuperWeb of all fields:
Good Instabilities
Casimir in deformed vacua
nonG-S

2013 MOCKing HEAVEN: *confucian inspiration*
bond@Cosmic Web cross-correlations in theory & in observations,
Cross-Correlating Cosmic Fields Conference, Shanghai, Oct
now interconnectivity of information e.g., Xcorr is ubiquitous, *so no more meetings, wait .. kyoto 2023*

to mock U cf. the uninspiring *forward modelling* phrase of AI meets cosmology, not even TopDown or BottomUp

cf. Reesian forecast of the 90s: cosmology will split into the chess players (earlyU) & the mud wrestlers, the cosmic weather of gastrophysical complexity - NO as vibrant as ever

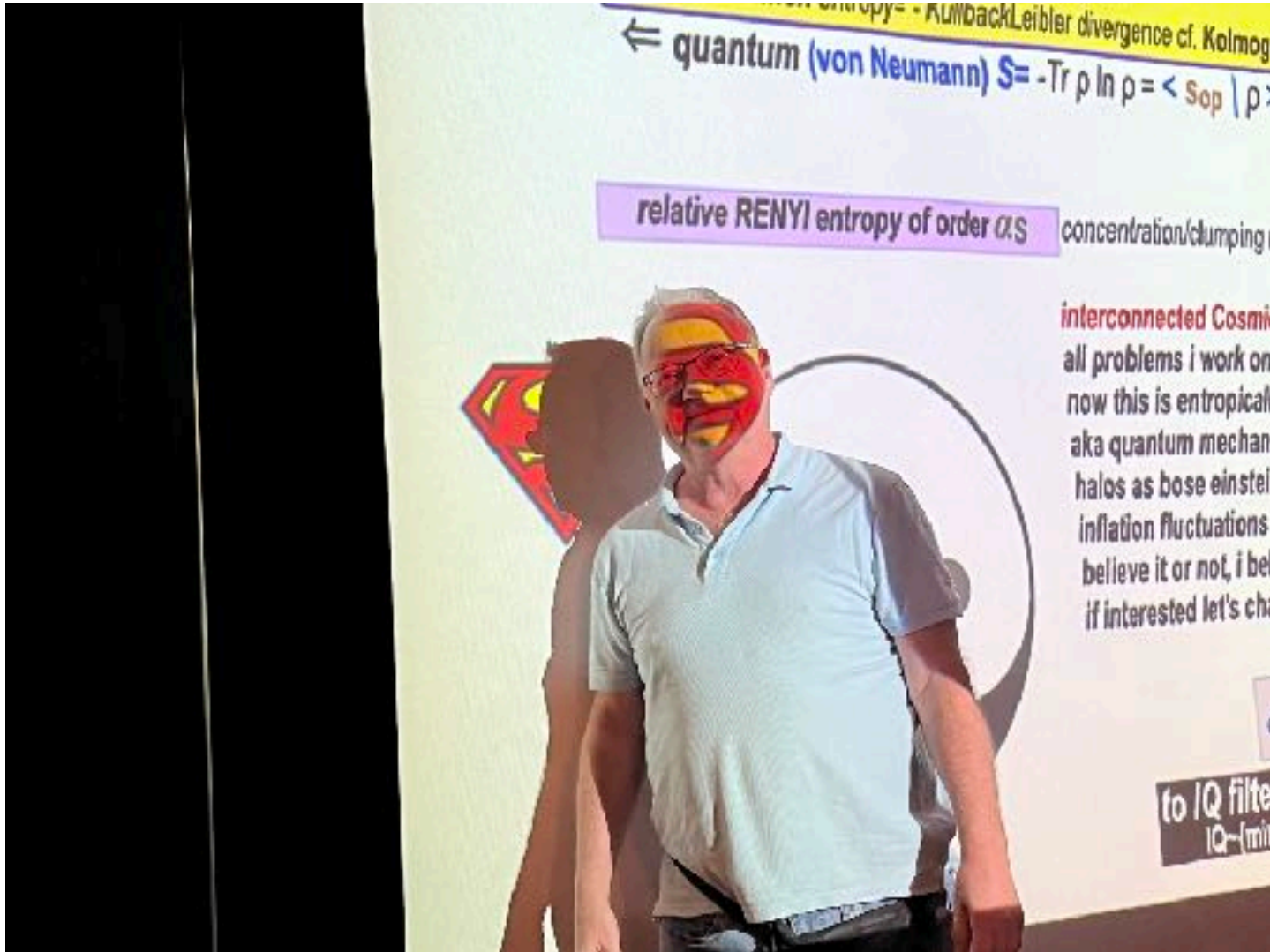
CνB + BBN
cosmology of GW
VMBH clusters beyond z of zilch
BSMc of all sorts
cosmoglobe++ program

quantum cosmology: **Studying the Cosmic enTanglement** Universe=System+Res =Signal+Noise **Duals**

Planck, AdvACT, SO, CMB-S4, CCATp, Spider LITEBIRD + SPT, BK, CLASS,.. optical/IR SDSSn, EUCLID, LSST, DES, HSC, DESI, SphereX, WFIRST radio LIM CHIME, HIRAX, COMAP, CHORD, EXCLAIM,..SKA, HERA, LOFAR, ..

one single vast entangled multi-messenger experiment probing the underlying BSMc to explore with novel statistical analyses

greetings from the ucsb kitp 23 01-03 cosmic web and galaxy formation program



Bond@kitp 23 02 15 intro slides credit: Brent Tully 23 02 15

π is for People

invoke as queen bee ~ Urania our Muse

cf. my usual mother nature as queen bee

Urania on the seal of the [Royal Astronomical Society of Canada](#),
motto: *Quo ducit Urania* ("Where Urania leads")

Those who are most concerned with philosophy and the heavens are dearest to her.
Those who have been instructed by her she raises aloft to heaven, for it is a fact that
imagination and the power of thought lift men's souls to heavenly heights

Urania is often associated with
Universal Love of the Heavens.

=> heavenly Aphrodite Urania

Muse on [Ukrania](#)
[@kopernicus academy](#)

Roman copy of Greek 4th century BC,
[Hadrian's Villa](#).

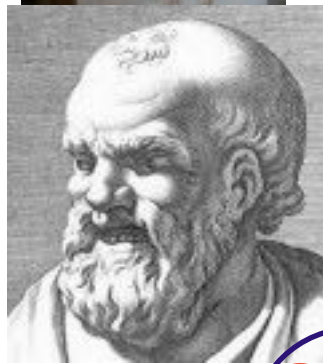


cosmic
thinkers
as
Musers
and
Mused
upon

& the
CITAZen
follows

PYTHAGORAS 550 BCE THEORIST

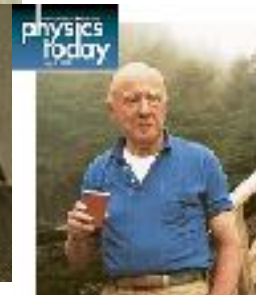
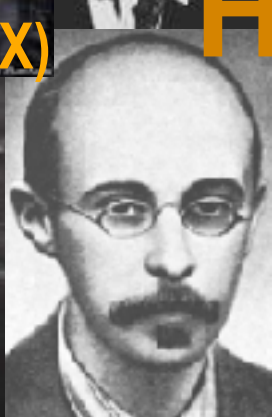
Cosmos \supseteq math, harmonic v/λ , digital



*a very brief human history
of how*
Cosmic Information
was generated by Us:
highly filtered,
compressed, reduced

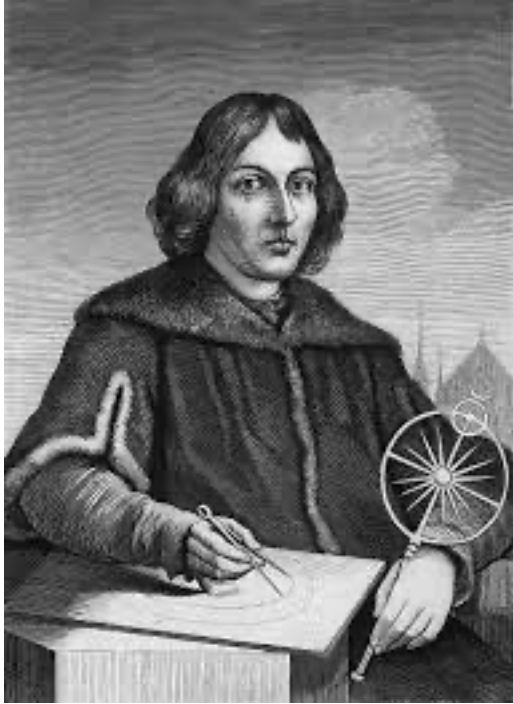


Q_{vac} $a \rightarrow 0$



muse on copernicus *aka Nick K.*

19 February 1473 – 24 May 1543



Giordano Bruno

February 1548 – 1600, aka 52
executed by burning, Rome

invocation by Michel Mayor
further discussion on life
by Didier Queloz

stars as distant suns
surrounded by their own [planets](#),
& foster life of their own.
universe is [infinite](#)
with no "centre".

what did you do in the pandemic? tremain [Dynamics of Planetary Systems](#).
cf. Binney and Tremaine, Galactic Dynamics. and what did bond do? i mused



π is for our **plank** - the scaffolding for the CITA work



PYTHAGORAS 550

BCE THEORIST

Cosmos \supseteq math,

harmonic v/λ

digital

π is for **Pythagoras**

mathematization of "reality/realities"

all is number (counts, bits, 01, S for entropy)

harmonic analysis (phase, S for action, k dual to X, ω to T, A to J)

$\Rightarrow \psi = \exp(iS_R - S_I)$ word equations e.g., QM = GR? suskind word equation

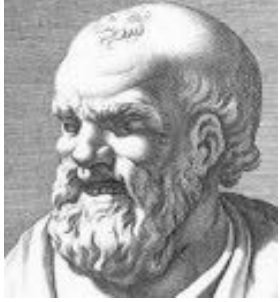
$\Leftarrow ER=EPR$ maldacena/suskind word equation

emergence \Rightarrow inflation \Rightarrow heat: flows $du = Dd\text{Timeflow} \nabla S + d\text{noise}$

coherent flow in the entropic-condensate $k < k_{\text{Jeans}}$

+ "quantum noise" fluctuating $k > k_{\text{Jeans}}$ aka $> k_{\text{Hor}} = H_a$
in fact **gradient flows of Gibbons-Hawking entropy**

+ $\& DdRG\text{flow} \nabla S$ scale space ADS/cFT



π is for Plato ideas => Ideas, capital I,

the growth of coherence,

emergence of prominent signals out of noise: $U=S+n$,

universality of map-making compression, *what we do*

IQ = *information quality cf. quantity (aka entropy)*

the ACADEMY => *Copernican Academy,*

& union of academies to inspire thoughtful thought

ps π is an Idea

U as buzzing hive, noisy chaos, here & there coherent time emerges, $1/H$, growing, an instability towards our coherent realities, a greater good (?)

down with multiverse, there is only One U!

but many realities that quantum diffuse - more word equations

Gamow 1904 – 1968 *the quantum tunneler!* (+cmb+dna+)

invoked by Jim Peebles

123 infinity

invoked by Bond 23.02.01 youtube podcast on

Theories of Everything ToE

<https://youtu.be/5pOpcCT6AmY>

Multiverses, Hubble Tension, Dark Energy | Dick Bond (yuck title)

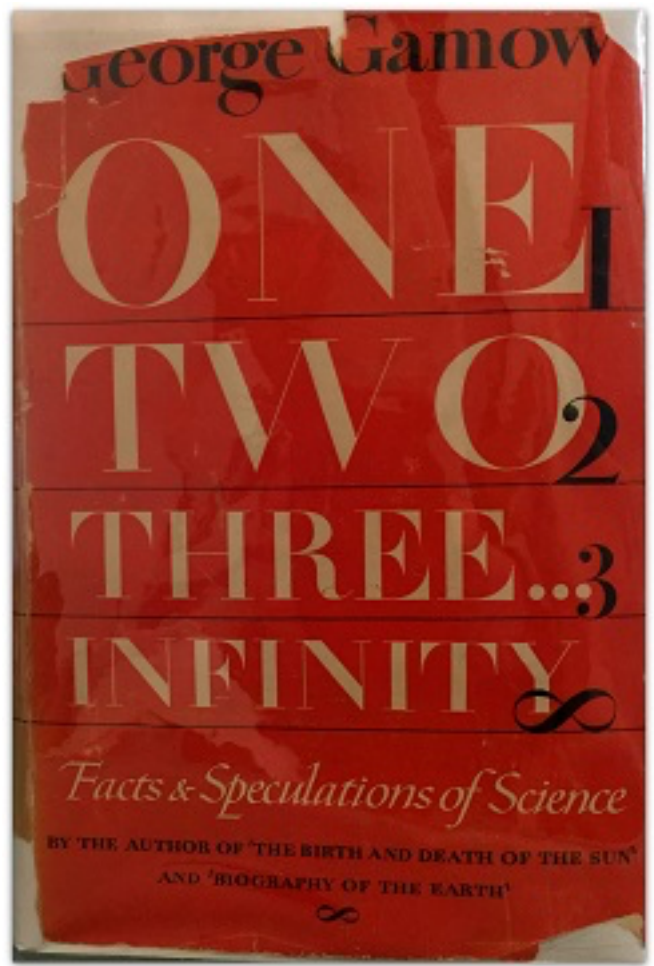
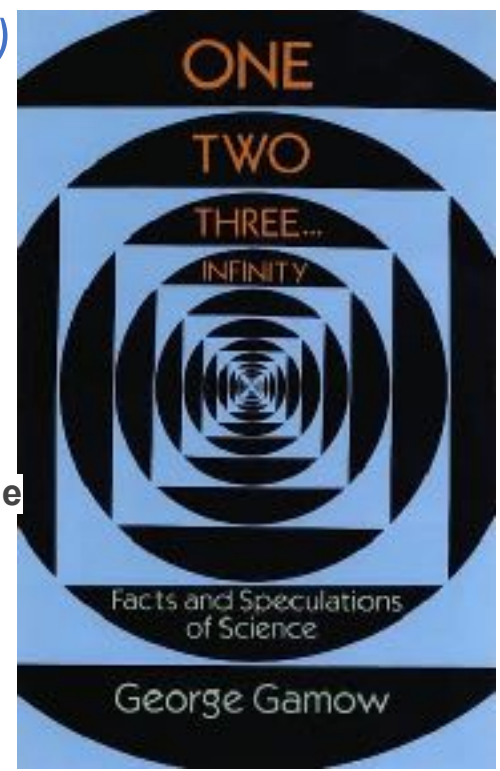
123 infty =ToE Tales of Everything

= Tales of Nothing aka (deformed) vaccua

from math to ylem to galaxies to planets to geology to life, a ToE before its time

also invoked by David Gross, Glynnis Farrar,

Steven Pinker, Sean Carroll, deGrasse Tyson etal etal



1956 Unesco Kalinga Prize to Gamow for popularizing science, including *One, Two, Three... Infinity*, (47-61) as well as other works

π is for People

the GUT: good Unified Theory, but not grand and not capital G Good **but a good ToE as the Tale of Everything we tell** & it should enthuse all CITAZen workers detailed work - **breadth as well as depth** for our **cosmic gather => analyze (IQ) => cosmic scatter** endeavours



π is

Dick Bond **CITA** *the summary*

CMB@50 THEN & NOW & THEN

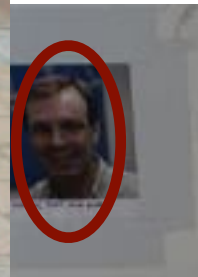
a celebration *Princeton June 2015*

for People

many CMB@50 zens
are here
at the NC@550 bday
- of course
now: family
gatherings
for each
experiment
as large

an extended CMB family reunion & Peebles@80

CMB prediction
Alpher, Gamow Herman 1950s Tcmb ~5K
CMB Discovery
Penzias & Wilson 65 @7cm
CMB dipole 70s DT /T~ V/c 360km/s
Delta T over Tea 87 @CITA theory+expt
COBE 1989 launch
Blackbody 1990 Tcmb = 2.725K -455°F
Anisotropies 1992 DT .Boomerang 98
WMAP 2001 launch
Polarization Revealed >2002
DASI,CBI 2002 Boom Quad
Planck 2009 launch
.. Planck 2015-18-20 precision U parameters
ACT SPT higher resolution + polarization
BICEP/Keck +Planck B =dusty no GW Spider
=> future
.. CMB Stage 3 (now) => SO SPT3g Spider2 CCATp
.. Stage 4 > 2025 (>>2025)
.. LiteBird 2028 (>), other satellites ??



π is for **Physics** = *natural* **Philo-sophia**

π is for **Planck**, $h\bar{c}$ + many ways 93-20



the next pictures are of all the telescopes

*i have been **en-tango-ed** with,*

**a cosmic dance of friends - how
science is done** (*as per Art, Barry, etal.*)

just kidding, well just one, ACT

RIP ACT 2022

best results
to come
2023 >
Planck

=ACT+WMAP

ACT+Planck

maps via
SciNet

@Toronto
computers

Sigurd Naess+

ACT@5170m



eureka
 π for pleasure



why Atacama? driest desert in the world. thus: cbi, toco, apex, asti, act, alma, quiet, polarbear, CLASS, CCATp@5600m, Simons Observatory, CMB Stage 4 also @South Pole - water vapour sublimates out

ACT \Rightarrow ACTPol \Rightarrow AdvancedACTPol fsky=0.45 now \Rightarrow Simons Observatory

π is for People: the dilemma of large teams - ever larger in the constricting pyramid - we try but need to be wiser



π for parameters CMB@58: CMB forever - to 2030-35- SO, CCATp, S4, Litebird (to 2050 LIMLAMing the entire sky: now HI CHIME, CHORD, HIRAX, HERA, SKA, ++, COMAP, CCATp, Exclaim CII, TIME, SPT3g!, SphereX, IFUs, MegaMapper, to PUMA, to the farside of the moon +++)

on cosmic **Photons** cosmic microwave background radiation 1st light $412 / \text{cm}^3$ 0.005%

on cosmic **Baryons** Ordinary Matter air $\sim \text{amu} / \text{nm}^3$ O₂ N ; U 4.9% H, He $\sim 0.055 \text{ amu} / \text{cm}^3$

on cosmic **Dark Matter** $\sim \text{amu} / \text{m}^3$ $26.6 \pm 0.7\%$ compressed in MilkyWay $\sim 0.3 \text{ amu} / \text{cm}^3$; for LHC@CERN-type relics ~ 1 every 10 cm or axions or ? e.g., *ultra-low axions, DM spectrum, h_{Planck}/m quantum diffusion*

on cosmic **Dark Energy** \sim vacuum potential density $\sim 3 \text{ amu} / \text{m}^3$ $68.5 \pm 0.7\%$ late-inflaton KE/PE?, coupled DE

on cosmic **Neutrinos** number density \sim cosmic photons Energy fraction $> 0.47\%$ \sim stars

on cosmic **Phonons** \sim isotropic **Strain** Deformations' *THE LIGHT* $h_{\text{Planck}} .. M_{\text{Planck}}$

on cosmic **Inflatons** - source the phonons $h_{\text{Planck}} .. M_{\text{Planck}}$

on cosmic **Gravitons** anisotropic **Strain** (*Transverse Traceless*) \ll photons / neutrinos h_{Planck}

on cosmic **Isocons** degrees of freedom transverse to the inflaton *on the potential surface* h_{Planck}

SMpp = Standard Model of particle physics electroweak + strong interactions

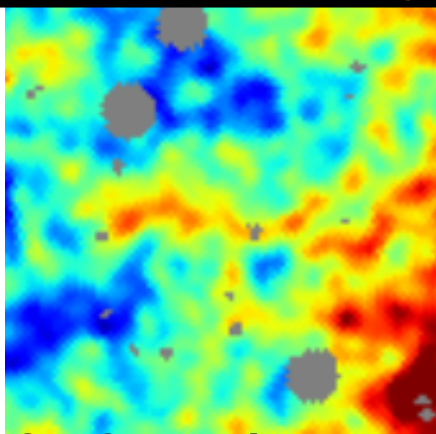
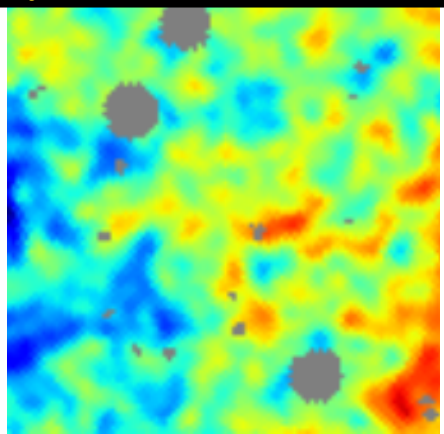
\Rightarrow *BSMpp = Beyond the SMpp* neutrino masses, Dark Matter, Dark Energy, Gravity, SUSY ...

SMc = Standard Model of cosmology tilted Gaussian LCDM model, B+DM+DE+photons+neutrinos

\Rightarrow *BSMc = Beyond the SMc* neutrino masses, dynamical coupled Dark Energy, modified Gravity, pNG, ...

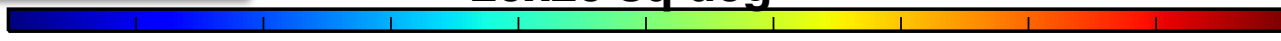
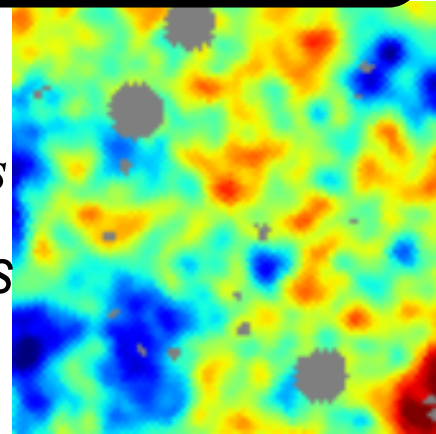
real ζ -WebSky mean field mapping of the entropic the emergent primordial S_I condensate

using Planck TE
to map beginnings
visibility mask



20x20 sq deg

real
 ζ -WebSkys
with
fluctuations



π is for **Primordial U=SuN** $\zeta, GW, isocon, DM, DE, pBH-eh$

relic1: the entropic condensate from inflation aka ζ

- observable MAPS! = mother of all cosmic structure CMB&LSS & stars/humans & ..

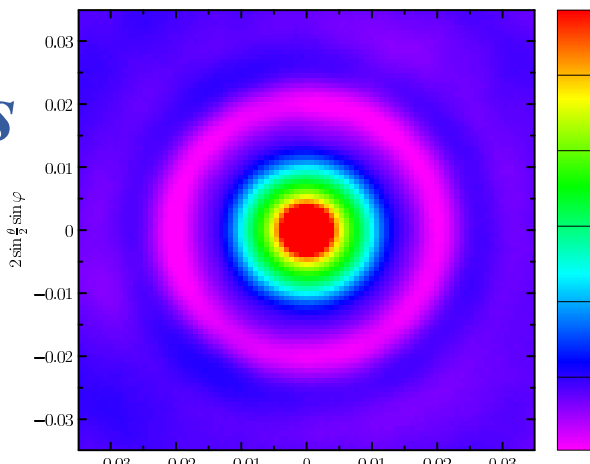
amplitude & slope only??!!! we need primordial nonGaussianity

(CITA brand is intermittent nonG, & novel LSS/CMB/LIMLAM stats in quest of this BSMc buried treasure)

real ζ -WebSkys
stacked to damp
fluctuations

$$\langle \zeta | \zeta_{pk} \rangle |_{dv}$$

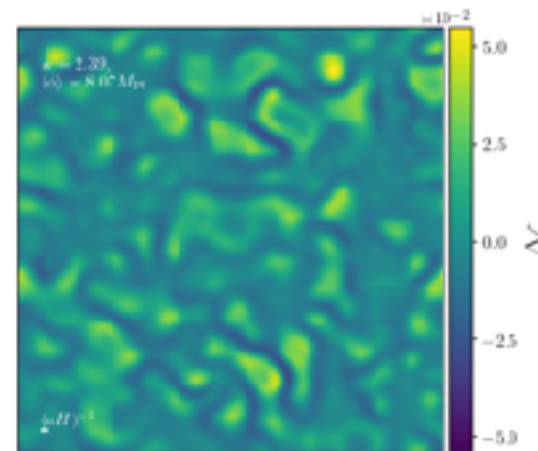
20857 patches on ζ maxima, random orientation, threshold $\nu=0$



early U nonG, BSMc

ζ -halo sources may lurk below
the usual SMC ~Gaussian
inflation models

- no standard fNL stats -
- & what if $\zeta \sim$ domain wall-relic
- ζ_{nG} can be on any scale, e.g.,
- high k, e.g., 1st *s, WebB hiz
- low k, CMB/LSS anomalies



Prob (system I order)

entropy = <information-content>

Quantity Shannon 1948

CITA Cosmic Information Theory & Analysis => QITA Quantum Information Theory & Analysis

IQ=information quality

3 stages of his career: 30s+ particles (nuclear) -> 50s+ fields (GR) -> 70s+ information

"Now I am in the grip of a new vision, that Everything Is Information. The more I have pondered the mystery of the quantum and our strange ability to comprehend this world in which we live, the more I see possible fundamental roles for logic and information as the bedrock of physical theory. ... I continue to search."

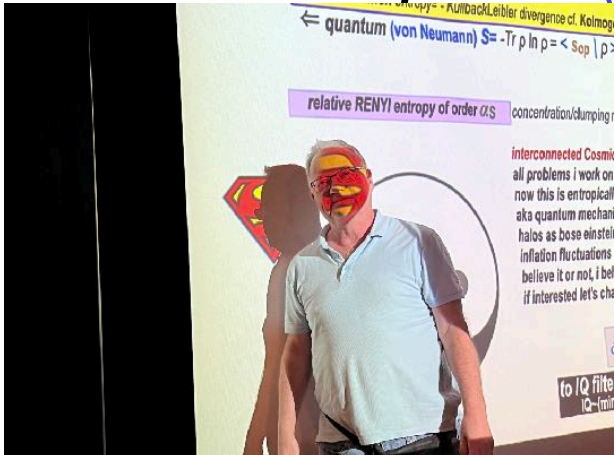
generalized parameter space {q} ~phase space
relative Shannon entropy = - KullbackLeibler divergence cf. KolmogorovSinai entropy

← quantum (von Neumann) $S = -Tr \rho \ln \rho = \langle S_{op} | \rho \rangle$ density matrix

of entropy+phase

IT from BIT
from BITs in IT

the medium is
the message
McLuhan 1964 UofT



interconnected Cosmic SuperWeb <= interconnected Web of Physics Ideas, with a capital I

**all problems i work on are interconnected to all others,
now this is entropically-radiating amongst all CITAZens, coherent-info flow,
the ToE, our tale of everything**

*aka quantum mechanical transport writ large,
halos as bose einstein condensates $k < k_{jeans}$,
inflation fluctuations as bose einstein condensates $k < k_{horizon}$*

believe it or not, i believe all these things to be true.

if interested let's chat, preferably spiritually-enhanced



$d\langle s_{fi} \rangle / dt < 0$ hiQ info begets negentropy, parameter volume ↓

IQ~{minimal length messages/codes | error tolerance}

my pre/post-pandemic S-web musing: the Tales of Everything **CQITA** in the **CQ-SWeb**, cosmic quantum superWeb of realities seen from S_f^i in-out info-transport tensor and IQ, beyond usual S_f^f & entropic current $J_S \sim \beta A^{Q_0} J_Q^i$

I/we/U continue to search

end of Bond's TIME