Chat for 'Time in a Sparse-Information Universe'

Collected by: **Team OrionX**
Time: 2025-06-14.12:00 EDT (Saturday)
Speaker: Terry Bollinger
Video: https://youtu.be/XBeSisQrh3g?t=00m00s

00:37:31	Mike H	Are the slides supposed to be moving?
00:48:33	Jarek Duda	The issue here is mentioned angular momentum of particles — for e.g. electron, the field around is already rotating (not point) … — Maja L, 00:50:04, ❤️ — Kevin Zheng, 00:50:17, ❤️ — Ashley Martin, 01:25:50, ❤️
00:51:51	George Zipperlen	A question for the end, if it hasn't been answered in Terry's talk: My understanding if information is limited to reading Shannon and Nyquist. There's a source of information, a receiver, and a noisy channel in between. Also a finite smallest time resolution, which implies a maximum frequency which can be resolved (Fourier transform). Curiously, the relation between time resolution and frequency resolution is like Heisenberg's uncertainty of non-commuting operators! What does information content of space even mean? Is it intensive or extensive. Is there only difference of information from one region to another, or is there a "sea level"? — Team OrionX at 00:52:24; George, can you unmute and ask this question after the talk? — George Zipperlen at 00:53:26; I can talk if my microphone works without causing echo. — Team OrionX at 00:53:57; Sure. Thank you. Please feel free to ask the question online. Or, you can dial in using your phone. — George Zipperlen at 00:54:28; Also, Terry may have this covered in his presentation. — George Zipperlen at 00:54:35; Sorry, I got disconnected.

01:04:55	Emre Koksal	@George Zipperlen: George, if you don't mind, I would like to give a shot to your question. There are a few different concepts in your question. In the question regarding the communication channel, it is more related to Nyquist (modulation and bandwidth) than Shannon (bits per channel use). For a signal, there is indeed an inverse relationship between pulse width in time and frequency as they are Fourier-inverse Fourier transform pairs. The time-bandwidth product is lower bounded, similar to the Heisenberg's uncertainty principle, where the same Fourier — inverse Fourier relationship exists between position and momentum. As per the notion of "information" physicist use, it is kind of different from the notion of information that is in communication theory. In physics, the "content" of information is generally defined as the difference between the entropy of the current arrangement of particles/objects and the maximum entropy distribution of the same system. Very different from communication of information, where the entropy of the source is maximized to increase the amount of information conveyed. — Ashley Martin at 01:26:34, 👏 One of the problems in physics is, certain concepts such as information and complexity do not have a unified mathematical definition, across the community. — Maja L at 01:06:26, 👏 — George Zipperlen at 01:06:58; Thank you, that is very helpful. I always have a hard time translating between physics, engineering, and mathematics! — Emre Koksal at 01:07:07, 👍 — Emre Koksal at 01:07:41; IMHO, you're asking the right questions.
01:08:45	George Zipperlen	"The unreasonable effectiveness of math..." —Wigner
01:08:58	Jarek Duda	https://youtu.be/lyXIHlulSQY — The water Casimir… but requiring a shaker. What is it in particle physics? Particle clocks themselves? — Maja L at 01:09:38, ❤️ — Ravi Sharma at 01:14:40, ❤️ — Ashley Martin at 01:26:43, ❤️
01:14:03	Maja L	Found this interesting research: Casimir effect in a quantum space-time https://www.researchgate.net/publication/267099628_Casimir_effect_in_a_quantum_space-time
01:16:18	George Zipperlen	Fragmentation answers part of my question!
01:17:58	Emre Koksal	Einstein's equality is about rest/inertial mass-energy equivalence while Planck's equality is about massless photons' frequency. How would the two meet in the same frame of reference and claimed to be somewhat equivalent?
01:18:40	Jarek Duda	Great, so we agree particle clocks propel, e.g., Casimir… But what propels them? Make particles oscillating in the lowest energy state — as https://en.wikipedia.org/wiki/Time_crystal?

01:22:16	George Zipperlen	Yes! I've been wondering how molecules do it!
01:25:06	Jarek Duda	Here is my toy model for particle clock propulsion from talk last week (e.g., https://community.wolfram.com/groups/-/m/t/3398814) — we need Hamiltonian term which prefers some time evolution (ψ_0 time derivative) in presence of particles: field spatial derivatives (ϕ_1) — Abhijeet AS at 01:30:51, 💡
01:25:29	George Zipperlen	These solitons remind me of @Jarek Duda 's time crystals! — Ashley Martin at 01:27:13, 👏 — Abhijeet AS at 01:28:27, 👏 — Maja L at 01:28:55, 👏 — Jarek Duda at 01:30:19, 👏
01:27:06	George Zipperlen	In differential geometry, a helix can be rigidly unwound to a pseudosphere (hyperbolic surface) like a trumpet
01:31:22	George Zipperlen	Agreed! Physical symmetry is observed (or not), math symmetry is a model
01:32:16	George Zipperlen	Just a minute, I'll try to connect
01:37:56	George Zipperlen	Thank you, Terry!
01:40:12	George Zipperlen	I'll try the phone, if moderators don't mind two copies of me so I can see the slides.
01:45:19	George Zipperlen	Sorry, Zoom on phone wants to spy on my calendar! — Team OrionX at 01:49:26, "George, I re-sent you the Zoom confirmation email. Please find the phone number to dial in." — George Zipperlen at 01:49:55, 👍 — Team OrionX at 01:53:15, "If you want to ask your question, please feel free to ask over the phone." — George Zipperlen at 01:54:02, "It hung up before I could copy paste meeting id on the phone. I will try to buy a new USB headphone/microphone with working microphone." — Maja L at 01:54:27, ❤️ — George Zipperlen at 01:57:20, https://www.linkedin.com/in/george-zipperlen/ — Maja L at 01:58:09, 👍
02:08:50	Maja L	Thank you so much for another wonderful talk and great discussion!
02:08:56	George Zipperlen	Thank you Terry, and Helen.
02:08:58	Louis Rifkin	Thx
02:09:01	Aniekan Afangideh	Thank you so much.