

STRINGS 2026

Concluding Remarks

Hiroshi Ooguri

6 – 10 June 2026, Shanghai, China



STRINGS 2027

Hamburg, September 6 - 10, 2027

Local Organizers:

Gleb Arutyunov

Till Bargheer

Craig Lawrie

Elli Pomoni

Volker Schomerus

Jörg Teschner

Timo Weigand

Alexander Westphal

Max Wiesner



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QUANTUM UNIVERSE



Plenary and Review Speakers of Strings 2026

In 2025,

- 4/08: Our friends in Shanghai reached out to the **Strings Planning Committee**, chaired by David Gross, to propose hosting Strings 2026.
- 5/19: The committee met with them and discussed their plan.
- 7/07: At ICBS, David Gross announced that Strings 2026 will take place in Shanghai.
- 9/23: The **Strings 2026 Scientific Program Committee** was formed.

Plenary and Review Speakers of Strings 2026

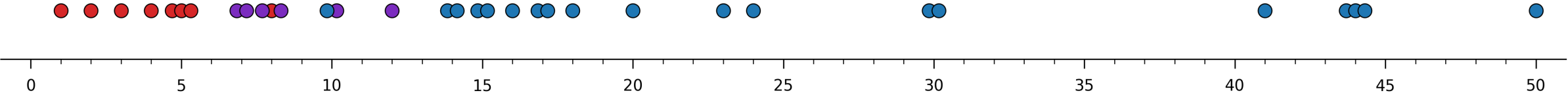
Committee Members: Rajesh Gopakumar, Michael Green, Sergei Gukov, Janet Hung, Zohar Komargodski, Hong Liu, Andrey Losev, Julio Parra Martinez, Hiroshi Ooguri (chair), Tadashi Takayanagi, Irene Valenzuela, Alexander Westphal, Xi Yin

Committee Charge: The Scientific Program Committee should determine the format of the scientific portion of the conference and select the plenary and review speakers. The committee should have autonomy. In particular, the committee should independently select the plenary and review speakers, free from outside influence.

Demographics of Plenary and Review Speakers

Academic Ages and Ranks of Plenary and Review Speakers

By Years from PhDs



Postdoc



Junior faculty



Senior faculty

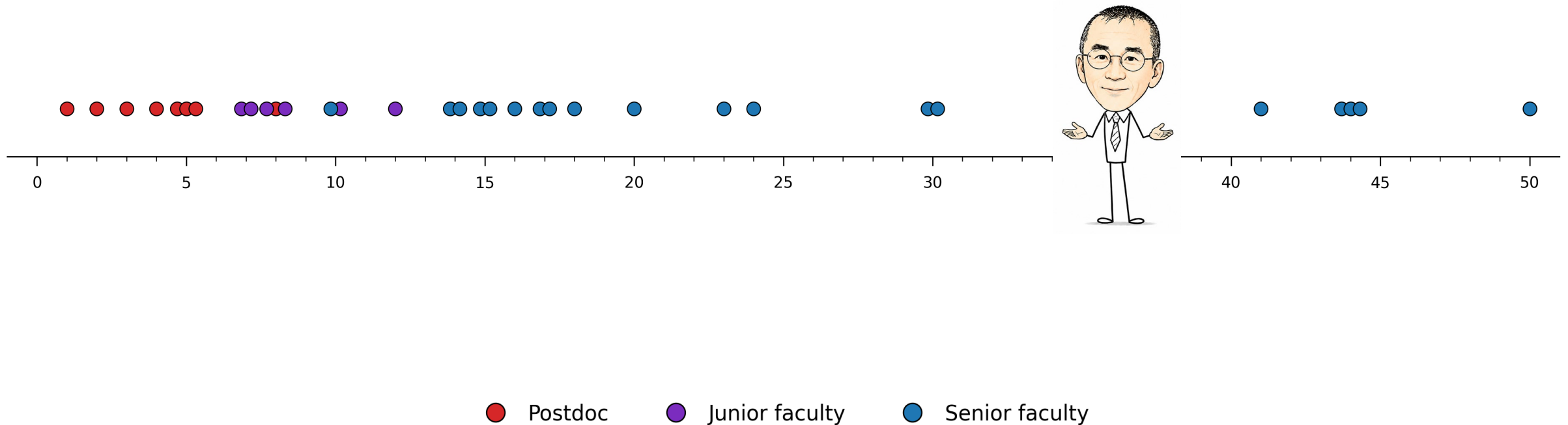
Postdocs 8

| Junior Faculty 6

| Senior Faculty 19

Academic Ages and Ranks of Plenary and Review Speakers

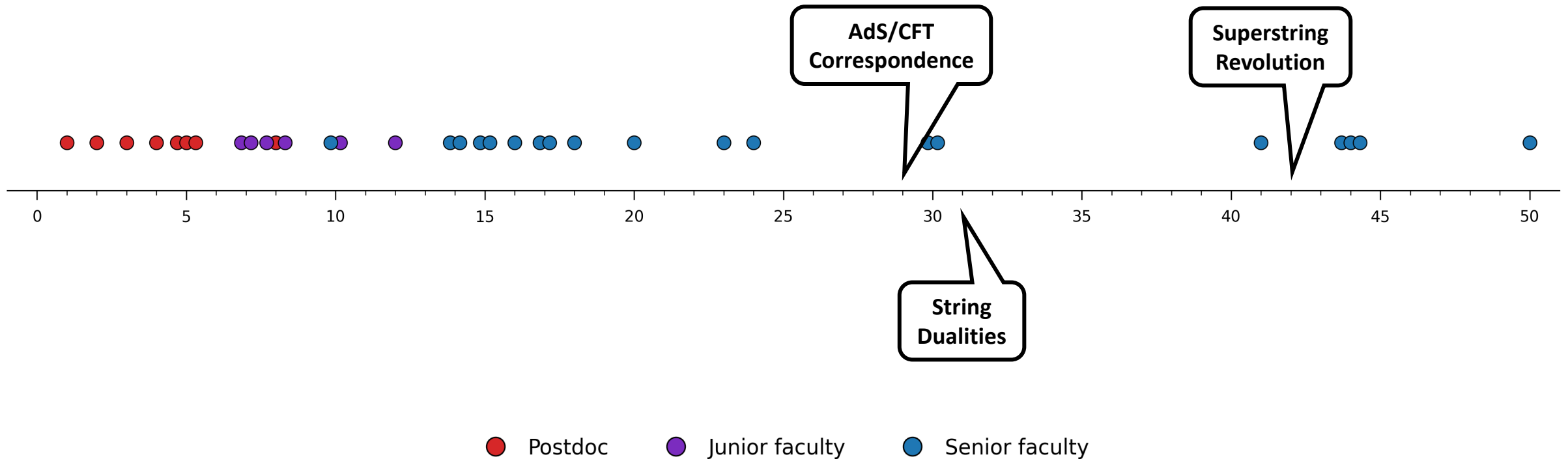
By Years from PhDs



Postdocs 8 | Junior Faculty 6 | Senior Faculty 19

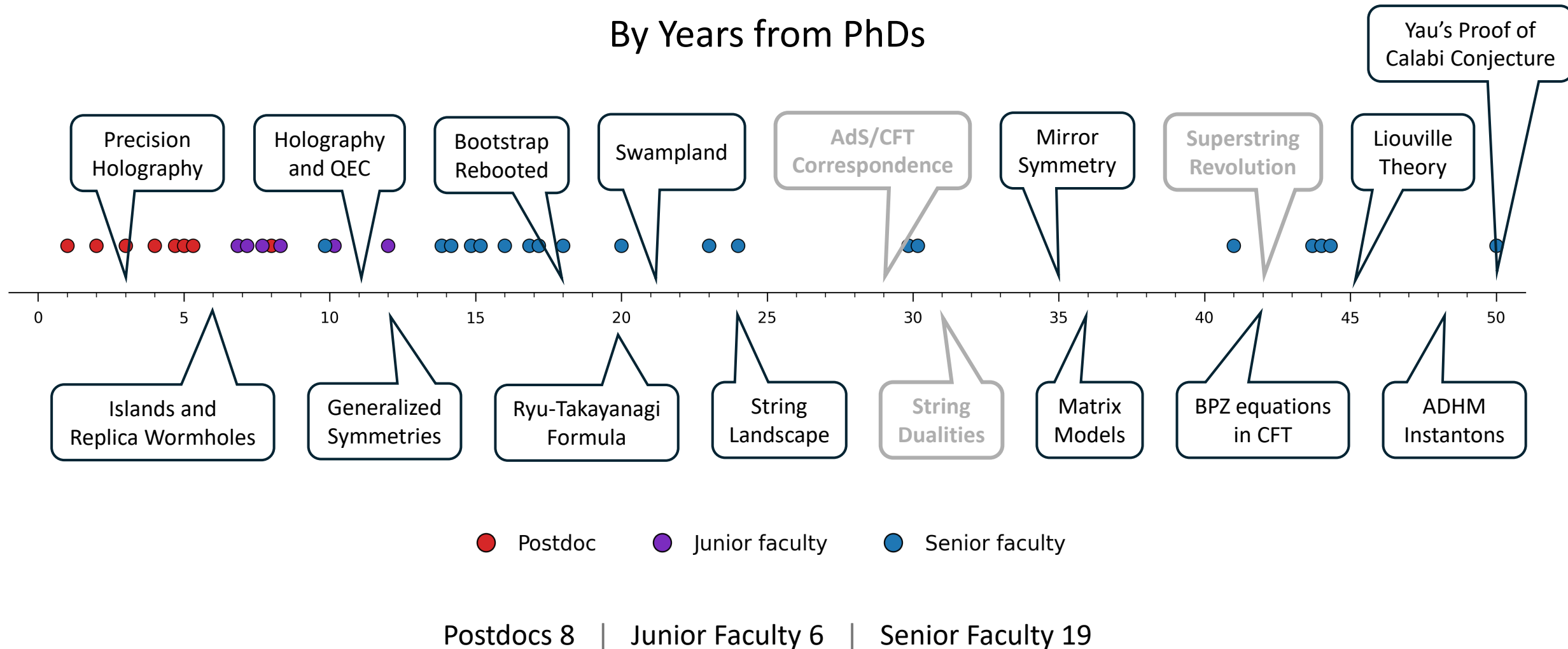
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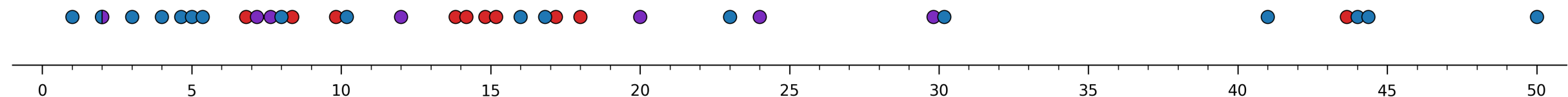
Academic Ages and Ranks of Plenary and Review Speakers



Geographic Distribution of Plenary and Review Speakers

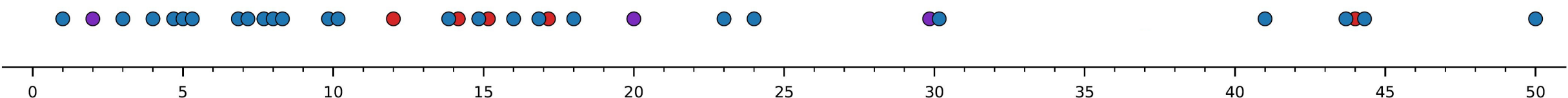
By Current Affiliations

Asia 10 | Europe & Canada 6.5 | USA 16.5



By PhD Institutions

Asia 5 | Europe & Canada 3 | USA 25

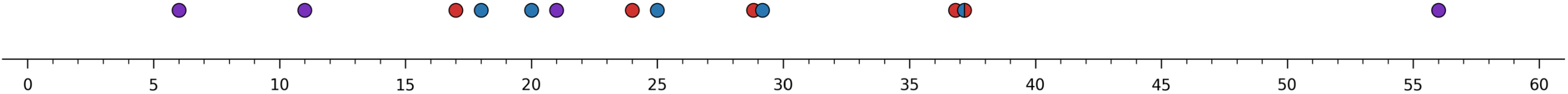


● Asia ● Europe or Canada ● USA

How about Committee Members?

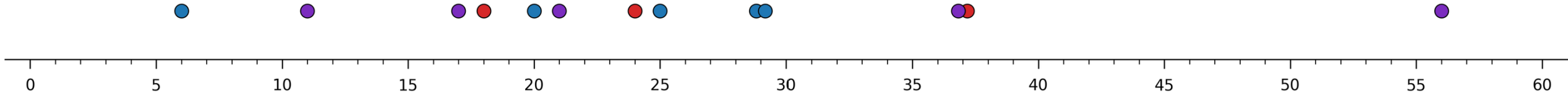
By Current Affiliations

Asia 4.5 | Europe 4 | USA 4.5



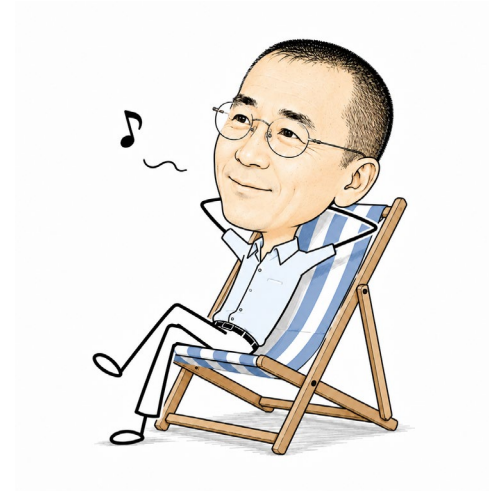
By PhD Institutions

Asia 3 | Europe 5 | USA 5



● Asia ● Europe or Canada ● USA

With that, I thought I had done my job
and would enjoy Strings 2026 as a participant.



On June 15, Slava Lysov wrote to me:

“Some of the local organizers (including myself) liked your review talk at the end of **Strings 2024** about current developments and the future of String Theory. Can you please make a talk of a similar type with a similar time format?”

What did I do at String 2024 at CERN?



With Andy Strominger, I collected

100 Questions

that can plausibly be answered
within the next ten years.

At universities, each tenure-track faculty member has a committee that monitors progress toward tenure.

Similarly, I asked those who had submitted questions in 2024 and other colleagues to provide their **candid assessments of our progress over the past two years.**

- *Are we on track to solve them in 8 (= 10 – 2) years?*
- *Should we keep them, revise them, or perhaps retire them?*

Is String Theory on track for tenure?

59 Questions

revised and updated after two years

Available at: <https://strings2026.simis.cn/concluding-remarks>

Worldsheet

1. What is the classical string theory dual to the large N limit of 3+1 d QCD?

[Ofer Aharony, *original*]

Progress over the past two years:

“I am still hoping that it can be answered in 8 years; **we are close to answering the analogous question for 2d QCD**, but of course that is a much easier case.”

- 15.** A long-standing problem concerns dual string formulation of the $N=1$ supersymmetric Yang-Mills theory. Perhaps **the deformed conifold background of type IIB superstring theory can serve as a useful starting point.**

[Igor Klebanov, *revised*]

Related questions by Victor Gorbenko [10] and Leonardo Rastelli [42].

2. Is there a worldsheet formulation of string theory in AdS?

[Shai Chester, *new*]

Progress over the past two years:

“Simplicity of conjectured **AdS Virasoro-Shapiro and Veneziano amplitudes**”

6. Can we construct the worldsheet theory that is dual to free SYM in 4D ?

(Can we prove the $\text{AdS}_5/\text{CFT}_4$ duality at least at one point in moduli space?)

[Matthias Gaberdiel, *original*]

Progress over the past two years:

“beginning to get **AdS₃ backgrounds with RR flux** under control.”

8. Do conformal bootstrap constraints on holographic CFTs place nontrivial constraints on the worldsheet CFTs of the dual AdS string theories?

[Chester’s talk]

[Rajesh Gopakumar, *original*]

29. What is the world-sheet formulation of string theory in non-stationary backgrounds?

[Nikita Nekrasov, *original*]

Progress over the past two years:

Baccianti, Eberhardt, Mizera,

- “One-Loop Four-Graviton String Amplitude at Finite α' ,” 2506.22105.
- “Precision Asymptotics of String Amplitudes,” 2601.09707.

50. How is the unitarity of the worldsheet internal CFT related to the unitarity of spacetime scattering amplitudes? Can we use spacetime unitarity to derive universal constraints in CFT? Why does the non-unitary complex Liouville theory give rise to a unitary spacetime string theory?

[Shu-Heng Shao, *new*]

Space of Theories

5. Is there a simple description of the complete set of all string/M compactifications with 8 supercharges?

[Michael Douglas, *original*]

Progress over the past two years:

“Understanding **finiteness, asymptotic limits.**”

41. Can we classify the space of consistent superconformal field theories in various dimensions by abstract bootstrap methods?

[Leonardo Rastelli, *new*]

Progress over the past two years:

“For maximally supersymmetric theories in $D=4$ and $D=6$ dimensions, embedding in string/M-theory suggests that we already possess the complete list — can this be put on **a rigorous footing by purely field-theoretic arguments?**”

Since any irreducible **4d N=4 SCFT** has a unique stress-tensor multiplet, its conformal manifold is one-dimensional and locally hyperbolic.

- Córdova, Dumitrescu, Intriligator: 1602.01217
- Beem, Rastelli, van Rees: 1612.02363

The questions are whether there is an **infinite distance limit** on the conformal manifold and **how the theory behaves in the limit**.

- Permuter, Rastelli, Vafa, Valenzuela: 2011.10040

They are part of what the Distance Conjecture is about.

Distance Conjecture

Vafa + H.O.: 0605264

Conjecture 0: Every parameter in quantum gravity is an expectation value of a dynamical field and can be varied by changing its expectation value.

Conjecture 1: Choose any point p_0 in the moduli space $\mathcal{M}$. For any positive ϕ , there is another point $p \in \mathcal{M}$ such that $d(p, p_0) > \phi$ (i.e., $\mathcal{M}$ has infinite diameter).

Conjecture 2: Compared to the theory at $p_0 \in \mathcal{M}$, the theory at p with $d(p, p_0) > \phi$ has an infinite tower of light particles starting with mass of the order of $e^{-\alpha\phi}$ for some $\alpha > 0$.

[Review talk by Timo Weigand]

40. Can we quantitatively describe large scale structures in the space of unitary, generic CFTs?

[Eric Perlmutter, *original*]

57. Can we find a bottom-up rationale or a way to assess the universality of the Swampland Distance Conjecture?

[Irene Valenzuela, *revised*]

Successes in deriving parts of the CFT Distance Conjecture.

- Perlmutter, Rastelli, Vafa, Valenzuela: 2011.10040
- Balthazar, Córdova: 2212.11186
- Baume, Calderón-Infante: 2305.05693
- Wang + H.O.: 2405.00674
- Komatsu, Kusuki, Meineri + H.O.: 2512.11045
- ...

McNamara's talk

- Unitary quantum field theories are determined by their closed-manifold partition functions.
- Every reflection-positive partition function arises from a unitary quantum field theory.

[Motivated by some of the issues reviewed by Zhenbin Yang]

Symmetry

21. Can we precisely quantify or prove a bound on the amount of breaking of global symmetries in quantum gravity?

[Miguel Montero, *amended*]

38. Given a low-energy EFT with a large spectral gap and a global symmetry which appears to forbid a scattering process: is there a lower bound on the corresponding cross section implied by “no global symmetries in quantum gravity”? *e.g.*, is there a minimum value of the cross section for proton decay implied by QG?

[Julio Para Martinez, *original*]

Related questions by Cindy Keeler [12].

Holography

18. Could we understand better any holographic example relating matrix integrals to Euclidean gravity solutions that are described by Einstein gravity?

[Juan Maldacena, *original*]

Progress over the past two years:

Supersymmetric mass deformation of the **IKKT matrix model** [9612115]

- Hartnoll, Liu: 2409.18706
- Komatsu, Martina, Penedones, Vuignier, Zhao: 2410.19173, 2411.18678

51. Is $\mathcal{L}w_{1+\infty}$ a symmetry of string compactifications to 4D flat space?

[Andrew Strominger, *new*]

Progress over the past two years:

[[Strominger's talk](#)]

“Every CFT₃ on the Einstein cylinder has an $\mathcal{L}_{\mathbf{A}}w_{1+\infty}$ algebra whose generators are conformal transformations of the ANEC operator and their commutators.”

Uniqueness

43. Now that we have found a set of S-matrix bootstrap conditions that uniquely output the mass and spin spectra, as well as the amplitudes (2508.09246), can we physically motivate these requirements and/or weaken them?

[Grant Remmen, *revised*]

20. Do the tree level n graviton Einstein, Type II and Heterotic S matrices constitute an exhaustive listing of such S matrices once we drop the constraint on the spins of exchange poles?

[Shiraz Minwalla, *original*]

Progress over the past two years (open string version):

Elvang, Herderschee, Morales, “String Theory from Maximal Supersymmetry,” 2601.11705

[Review talk by Cliff Cheung]

Definition

46. We know what field theory is, because we have axioms. But, what is, axiomatically, string theory? *e.g.* **can we axiomatize a notion of string theory well enough so that the statements like "there is a dual string theory description of gauge theory" or "there is a dual string theory description of critical 3d Ising model" become sharp questions allowing, at least in principle, yes or no answers.**

[Slava Rychkov, *new*]

11. Quite a lot (most?) of the progress on quantum gravity in the last 20 years has happened using methods that, although partly motivated by string theory, do not rely on the detailed UV structure of the theory. On the other hand progress towards finding a general non-perturbative formulation of string theory has largely stalled. Will these two statements continue to be true? Or will we/have we reached a point where we need more concrete information about the theory to proceed?

[Daniel Harlow, *new*]

13. Can **string field theory** be formulated non-perturbatively, and can it provide a window to non-perturbative physics? [Manki Kim, *revised*]

String Field Theory reviewed by Ashoke Sen and discussed by Shai Chester and Manki Kim

Definition of Amplitudes in String Theory, moderated by Andrei Losev

- How to **integrate over the moduli space** of Riemann surfaces (Victor Rodriguez)
- How **string field theory** deals with divergences (Ashoke Sen)
- How to use the moduli space of **super Riemann surfaces** (Edward Witten)

16. Is there a non-perturbative formulation of topological string on **compact Calabi-Yau**?

[Shota Komatsu, *original*]

47. Can we use **resurgence** to compute transseries for observables/correlation functions in generic string theoretic backgrounds?

[Ricardo Schiappa, *original*]

48. Can non-perturbative type IIB string theory in $D=10$ be **defined as the sum of the contributions from its saddle points**?

[Ashoke Sen, *revised*]

[Review talk by Marcos Marino]

17. Resurgence has already been applied to various individual physical observables. Can one formulate a version of **resurgence that operates at the level of Hilbert space or operator algebra?** Answering such a question would probably have much more significant consequences on our understanding of non-perturbative gravitational Hilbert space, than performing the resurgence analysis of individual observables.

[Shota Komatsu, *new*]

Worksheet

Holography

Space of Theories

Uniqueness

Symmetry

Definition

I have one more wish...

24. Is there a conceptual explanation of Mathieu (and Umbral) Moonshine, including the genus zero phenomena?

[Gregory Moore, *original*]

$$\begin{aligned} & \hat{A} \times ch\left(\bigotimes_r \Lambda_{q^r} T \bigotimes_s S_{q^s} T\right) \Big|_{K_3} \\ &= -2\chi_{\ell=0}(q) + 20\chi_{\ell=\frac{1}{2}}(q) \\ &+ 2\left(45q + 231q^2 + 770q^3 + 2777q^4 + 5796q^5 + \dots\right) \times q^{-1/8} \frac{(\vartheta_3(q))^2}{(\eta(q))^3} \end{aligned}$$

- H.O.: PhD Thesis (1989)
- Eguchi, Tachikawa + H.O.: 1004.0956

“I would definitely NOT retire this question.”

[Gregory Moore]

String Theory has not earned tenure yet,
but



July 10, 2026

Dear String Theory,

I am pleased to inform you that your reappointment has been approved.

We are deeply impressed by what you have accomplished, confident in your trajectory, and excited about your potential to identify the fundamental laws of nature.

Best regards,

大栗博司

Hirosi Ooguri

Kent and Joyce Kresa Leadership Chair,

Division of Physics, Mathematics and Astronomy

Fred Kavli Professor of Theoretical Physics and Mathematics

Scientists are travelers without maps.

The Strings Conference provides us an oasis to pause, compare paths, and see how far we have come.

As Xin Qiji of the Southern Song dynasty wrote in his poem,

***Green mountains cannot stop the river;
in the end, it flows eastward (toward the sea).***

May the ideas and techniques discussed at Strings 2026 continue to flow, and may we have great fun discovering where they lead.

青山遮不住
毕竟东流去

I also need to address
the elephant in the room.





Reflection on AI

I do not think anyone can confidently predict what capabilities AI will acquire over the next few years. Therefore, it may not be meaningful to pose an analogous question with a ten-year timeframe. Instead, I asked:

- Which aspects of AI and the future practice of string theory should our community be considering now?
- What would you say to a graduate student beginning string theory today about the possible role of AI in their scientific life?

Collective Knowledge and Attention

“AI will enable us to make **large verified knowledge bases** of math/physics and we should start doing this for string theory.”

[Michael Douglas]

“One potential use of AI could be to help build a **curated, reliable, and searchable library** of key developments, making the accumulated knowledge of the field more accessible. Beyond retrieval and summary, AI could also help **identify unexpected connections** among these developments, suggesting new questions or reorganizing old ones in useful ways.”

[Jaume Gomis]

“**The bottleneck for many problems in our field might not be intelligence after all, but attention.** So, I am hopeful that AI will cure this bottleneck, solve all the problems solvable with current tools, and leave the interesting/hard ones to us to explore.”

[Julio Para Martinez]

New Tools, Better Problems

“For now, it is sensible to use it to maximum advantage, rather than continuing our familiar research patterns. This requires **some investment in learning how to get the most out of it**. I believe there is reason for **cautious optimism** that it will enable us to discover much more about the laws of nature over the next decade than seemed plausible only a few years ago.”

[Andrew Strominger]

“In addition to making certain problems easier to solve, AI has the potential to **change what kinds of problems we would even find tractable.**”

[Grant Remmen]

“it is important to learn how to use it, and how to do so responsibly. On the other hand, **if an agentic LLM loop can solve your problem, perhaps you need to find a better problem!**”

[Julio Para Martinez]

Judgement, Verification, and Quality

“do not let it replace your judgment, taste, or voice. Let it help you explore ideas, check calculations, and navigate the literature — but choose problems because they are fundamental and interesting to you, not because they are doable for AI.”

[Jaume Gomis]

“Verification should always come before belief. AI should amplify one’s ability to solve physics problems, not replace independent judgment.”

[Sridip Pal]

“Rather than using AI to produce more papers, should the community consider **less but much better / much harder papers?**”

[Ricardo Schiappa]

Creativity

“For the graduate students — the bar is now higher, as LLM can emulate some students for sure— so **foundations, creativity and authenticity** is even more precious.”

[Nikita Nekrasov]

“it will be getting more and more important to develop the **ability to come up with ideas** that no one else would think of, rather than the ability of keeping up with the latest trends quickly.”

[Tadashi Takayanagi]

“Will a human hep-th physicist, working with an AI agent, find that the agent – and not the human – has formulated a **truly new and fruitful idea?**”

[Gregory Moore]

Copernican Revolution?

“If eventually it overtakes us and solves the problem of quantum gravity and all other forces, I'll be happy. Even if I do not understand the solution, it should make experimental predictions (like the ratio of the muon and the electron mass) that we should be able to verify.”

[Ashoke Sen]

“I don't think the reasoning capability has an upper bound given by the genetics of Homo Sapiens. [...] **I won't be surprised if AIs might become vastly superior to humans in their ability to do theoretical parts of research.** I would then happily ask various string theory questions to the AIs. [...] Will it be any different than using Mathematica to do symbolic computations not capable by humans, or using clusters to do numerical computations not capable by humans?”

[Yuji Tachikawa]

Humility

“I would tell graduate students to ignore what I and others of my generation say about AI. I would encourage them to learn to use it in novel ways to solve physics problems!”

[Juan Maldacena]

H.O.: What do you think of these responses?

ChatGPT: They are reassuring. I especially enjoyed the recurring hope that AI will remain a tool. Future historians may find that adorable.

Good luck, humans.

As Strings 2026 draws to a close, I am reminded of a Tang-dynasty poem by Wang Bo, written as he was bidding farewell to a friend:

***With true friends across the world,
even the ends of the earth feel like close neighbors.***

Many of us came to Shanghai from faraway places to meet, discuss, and learn about the latest developments across string theory.

Thanks to the warmth and hospitality of our hosts, Strings 2026 has felt not like being away from home, but like being part of one shared community.

A piece of calligraphy in black ink on a light background. It consists of two vertical columns of Chinese characters. The right column reads '海内存知己' (Hǎi nèi cún zhī jǐ) and the left column reads '天涯若比鄰' (Tiān yá ruò bǐ lín). Together, they form the famous line from Wang Bo's poem '送杜少府之任蜀州' (Farewell to Mr. Du, a Minor Official, as he takes his post in Shu). The characters are written in a bold, expressive cursive style (caoshu).

海内存知己
天涯若比鄰

衷心感谢大家

Auf Wiedersehen in Hamburg.