

# Lightning Introductions

**Next Steps in Quantum Computing:  
Computer Science's Role**  
May 22-23, 2018



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# Matthew Amy/University of Waterloo



I hope to bring some insight on building fully-automated tools for optimizing and verifying quantum circuits.

Primer is a favourite of mine. The time travel mechanics were inspired by Feynman diagrams, so there's a connection.



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**Sometimes you trap the ion**



**and sometimes the ion traps you**

tion

# Greg Byrd/North Carolina State



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IBM Network Q Hub,  
Interest in memory hierarchy, error correction

*Fargo:* very, very cold!



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# Jonathan Carter/Lawrence Berkeley National Laboratory



A perspective on large-scale classical simulation and some experiments on current noisy quantum hardware.

ALIEN

Ash: I can't lie to you about your chances, but...  
you have my sympathies.



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## Vipin Chaudhary/NSF



What do you hope to bring to the workshop?

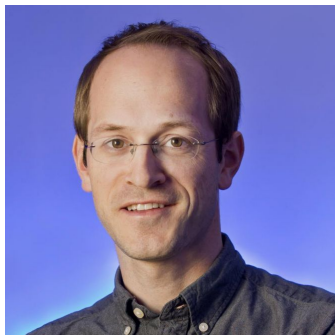
What's your favorite movie and how is it related to quantum computing (if at all)?



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# Andrew Childs/University of Maryland



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*What do you hope to bring to the workshop?*  
Discussion of quantum algorithms and their  
implementation in realistic devices

*Favorite quantum movie?*  
The Matrix



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# Fred Chong/University of Chicago



Discussion of software-hardware co-design to more efficiently map algorithms to devices

The Princess Bride: “My name is Inigo Montoya, you killed my cat. Prepare to die!”



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# Almadena Chtchelkanova/NSF



What do you hope to bring to the workshop?

What's your favorite movie and how is it related to quantum computing (if at all)?



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# Dave Clader/Johns Hopkins Applied Physics Laboratory



What do you hope to bring to the workshop? A broad perspective on quantum computing from algorithms down to device physics.

What's your favorite movie and how is it related to quantum computing? Deadpool (it's the only recent one I have seen and remember that wasn't a kid's movie). Not really related to quantum, except perhaps Ajax used a QC to determine how to modify DNA.



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# Tom Conte/Georgia Tech



**What we did/said Re: QC in the  
IEEE Rebooting Computing Initiative  
and International Roadmap for Devices and  
Systems [*née* “ITRS”]**

**Raiders of the Lost Ark: “I don’t know. I’m  
making this up as I go.”**



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# Nathalie de Leon/Princeton University



Discussion of quantum technologies at the device level, materials and integration challenges

Does The Wire count as a movie?



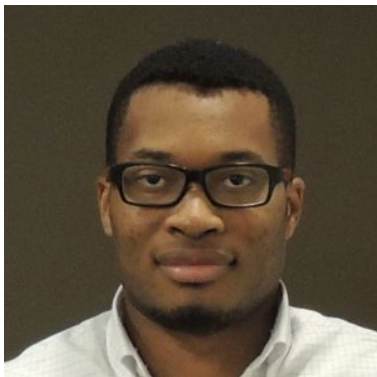
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# Khari Douglas/CCC



Learn more about how quantum computing will impact the future of computing.

The Dark Knight - chaos?



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# Ann Drobnis/CCC



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A hope that we can get past the  
“buzz-word-iness” of quantum, especially in DC

The Natural: nothing at all to do with quantum...



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## Monisha Ghosh/NSF



What do you hope to bring to the workshop?

What's your favorite movie and how is it related to quantum computing (if at all)?

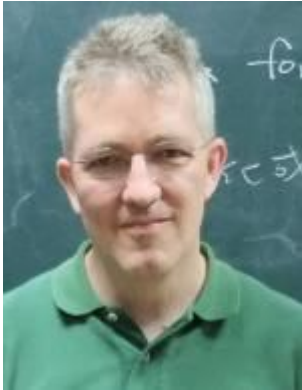


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# Markus Grassl

## Max Planck Institute for the Science of Light



MAX PLANCK INSTITUTE  
for the science of light

I consider myself lucky to have entered the field more than 20 years ago, working on QECC and search algorithms from an algebra/discrete math perspective. I hope for more applications with substantial quantum speed-up.

“Once Upon a Time in America” - it took a bit longer to realize it, but it was worth all the effort (in my opinion)



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# Emily Grumbling/ National Academies of Sciences, Engineering, and Medicine



A cross-disciplinary background (PChem; IT policy) and a desire to frame new questions.

*The National  
Academies of* | SCIENCES  
ENGINEERING  
MEDICINE



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# Daniel Gunlycke/U.S. Naval Research Laboratory



**U.S. NAVAL  
RESEARCH**  
LABORATORY

What do you hope to bring to the workshop?

What's your favorite movie and how is it related to quantum computing (if at all)?



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## Aram Harrow/MIT

*What do you hope to bring to the workshop?*  
 Ideas for hybrid classical-quantum algorithms  
 and architectural improvements.

*What's your favorite movie and how is it related  
 to quantum computing?*

Dr. Strangelove.

I really hope there is no relation, although  
 some say we must not allow a  $T_2$  gap.



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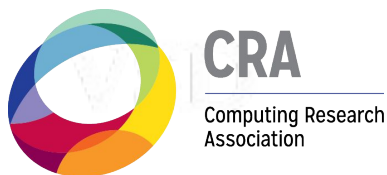
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# Peter Harsha/Computing Research Association



A hope to gain understanding what a research agenda in quantum looks like (and how to convey that to policymakers)

*Hitchhiker's Guide to the Galaxy*. Quantum sometimes sounds a lot like the Infinite Improbability Drive.



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# Mark Heiligman/IARPA

Photo Not  
Available



What do you hope to bring to the workshop?

Enthusiasm for quantum computing tempered by reality.

Favorite Movie: Marx Brothers “A Night at the Opera”

**Fiorello:** Hey, wait, wait. What does this say here, this thing here?

**Driftwood:** Oh, that? Oh, that's the usual clause that's in every contract. That just says, if any of the parties participating in this contract are shown not to be in their right mind, the entire agreement is automatically nullified.

**Fiorello:** Well, I don't know...

**Driftwood:** It's all right. That's, that's in every contract. That's, that's what they call a sanity clause.

**Fiorello:** Ha-ha-ha-ha-ha! You can't fool me. There ain't no Sanity Clause!



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# Bettina Heim/Microsoft Research



Microsoft

What do you hope to bring to the workshop?  
Questions. And a software stack. But mostly questions.

What's your favorite movie and how is it related to quantum computing?  
Gattaca. No particular relation - I just like the spirit.



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# Mark D. Hill/University of Wisconsin-Madison



**UW-Madison & CCC Vice Chair  
& Google Hardware Sabbatical**

I bring concerns re QC hype (no, not for your laptop). I want to understand **best-case** scenarios & any connections to ML

2001: A Space Odyssey [1968 & now]  
where QC may be need to explain it



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# Andrew Houck/Princeton University



Superconducting quantum hardware and  
analog quantum simulation

**Amadeus.** Your work is ingenious. It's quality work. And there are simply too many ~~notes~~ dimensions in your Hilbert space, that's all. Just cut a few and it will be perfect.



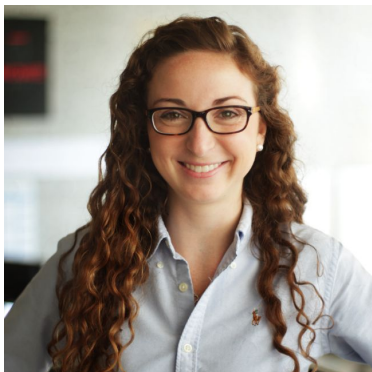
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# Meghan Houghton/NSF



Computer & Information  
Science & Engineering  
(CISE)

Discussion around opportunities for  
public-private partnerships in quantum.

Not sure it is an all time favorite, but Forrest  
Gump comes to mind...  
[Quantum] is like a box of chocolates, never  
know what you're gonna get???



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# Travis Humble, Oak Ridge National Laboratory



What do you hope to bring to the workshop?

*Technical vision to advance scientific computing and energy security using quantum computers*

What's your favorite movie and how is it related to quantum computing (if at all)?

*Casablanca*

"Louie, I think this is the beginning of a beautiful friendship."



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## Ali Javadi-Abhari/IBM



Some perspectives on making quantum computers accessible to researchers and the public through open-source software.

Pulp Fiction: It's actually the opposite of Quantum Computing because it's nonlinear.



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# Sonika Johri/Intel



Experience designing algorithms for and using near-term quantum computers

**Favorite Movie: Blade Runner**

(The replicants have short T1 times)

Roy Batty: I've seen things you people wouldn't believe. Attack ships on fire off the shoulder of Orion. I watched C-beams glitter in the dark near the Tannhäuser Gate. All those moments will be lost in time, like tears in rain...



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# Jamil Kawa/Synopsys



A comprehensive perspective of quantum computing architecture, hardware realization and algorithms

Dr Zhivago: Many scenes were cryogenic in feel and in backdrop!!



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# Jungsang Kim/Duke University & IonQ



Systems and engineering perspectives to designing, constructing and using useful quantum computers for practical applications

Star Wars:

“It’s a(n ion) TRAP!!”

“May the (spin-dependent) force be with you.”



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# Vadym Kliuchnikov/Microsoft Research



Industry and research experience in quantum circuit synthesis, optimization and layout

Stalker



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## John Kubiawicz/UC Berkeley



**Berkeley | EECS**  
Electrical Engineering and Computer Sciences

*What do you hope to bring to the workshop?*  
Long-term interest in quantum computer architecture  
and quantum CAD design;  
Area Delay to Correct Result (ADCR)

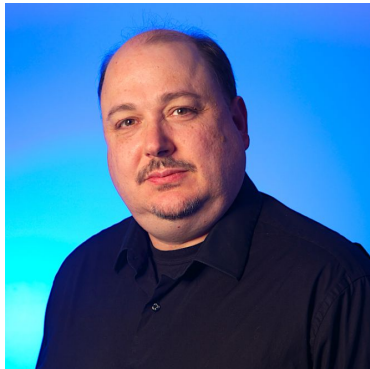
*Favorite Movie:* The Adventures of Backaroo Banzai:  
“Wherever you go, there you are.”  
QC: The Overthruster takes you into the 8th dim



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# Bradley Lackey/NSA & QuICS



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Expertise and enthusiasm about quantum information, programming languages, and mathematical logic.

*The Third Man* (since its about crime and murder, I hope there's no relation to quantum information)



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## Yi-Kai Liu/NIST



What do you hope to bring to the workshop?  
*Experience with many different layers of the quantum computing “stack,” from quantum algorithms to device characterization*

What’s your favorite movie and how is it related to quantum computing?  
*“Midnight Run” -- it reminds me of my colleagues :)*



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# Igor Markov/University of Michigan



## Expertise in

1. **Synthesis, optimization verification and *simulation* of QCs**
2. Classical Electronic Design Automation, including **design flows and optimizations for logic and physical synthesis**
3. **Combinatorial and numerical optimization**

## Movies & quotes -

### Inception

- Well, dreams, they feel real while we're in them, right?
- You musn't be afraid to dream a little bigger ...
- We need a big kick!

### The Matrix - a movie about the Church-Turing hypothesis

- There is a difference between knowing the path and living the path

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# Margaret Martonosi/Princeton University



Toolchain and architecture experience

+

Ideas on how CS disciplinary expertise  
is needed as QC develops

Favorite Movie? Invictus

Relation to QC? Almost none! Maybe some of the lines  
from the poem? “Bludgeonings of chance”...



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## Dmitri Maslov/NSF



What do you hope to bring to the workshop?

What's your favorite movie and how is it related to quantum computing (if at all)?



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# Peter Shor/MIT



What do you hope to bring to the workshop?

I hope to get ideas for algorithms that can be run on small quantum computers.

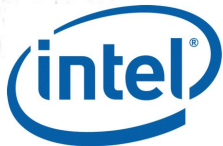
Favorite movie: Back to the Future. Are flux capacitors useful for quantum computing?



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## Anne Matsuura/Intel



What do you hope to bring to the workshop?  
*Experience developing multidisciplinary R&D programs - Leading a research team of quantum algorithm researchers & architects*

Favorite movie? *Hugo*

QC Related? *"My friends, I address you all as you truly are; wizards, mermaids, travelers, adventurers, magicians... Come and dream with me!"*



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# Mimi McClure/NSF



I bring my best listening ears and open mindedness to the workshop. I'm very interested in what the participants have to say.

I'm a total Harry Potter fan but he doesn't need quantum, he's got magic. Hmmm, there may be some commonality.



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# Michael Mislove/Tulane University



What do you hope to bring to the workshop?  
*Experience with semantic models for classical  
and quantum programming languages*  
What's your favorite movie and how is it related  
to quantum computing (if at all)?  
*Midnight in Paris - the time travel was  
obviously a quantum effect!*



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# Yunseong Nam/IonQ



What do you hope to bring to the workshop?  
Fresh eyes to look for new opportunities in quantum resource savings!

What's your favorite movie and how is it related to quantum computing (if at all)?  
007 - A quality watch and ... Q.



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# Massoud Pedram/University of Southern California



What do you hope to bring to the workshop?

What's your favorite movie and how is it related to quantum computing (if at all)?



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# Irene Qualters/NSF



What do you hope to bring to the workshop?

What's your favorite movie and how is it related to quantum computing (if at all)?



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# Moin Qureshi/Georgia Tech



**What do you hope to bring to the workshop?**

An architectural perspective on Quantum Computing + interest in system level metrics for reliability and performance of NISQ computers

**Fav Move? GATTACA**

**Related?** (perhaps to Errors in Quantum)

*“They have got you looking for any flaws [Errors], that after a while that’s all you see”*



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# Robert Rand/University of Pennsylvania



Let's talk about formally verified quantum programming!

I really enjoyed X-Men: First Class.  
Little known fact: Cerebro is a quantum computer.



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# Martin Roetteler/Microsoft Research



Passionate about quantum algorithms, in particular for problems where there is a *dramatic* speedup

I work on quantum programming languages and develop libraries for Microsoft's Q#.

My favorite movie by far is The Big Lebowski.  
Because it really ties the (Hilbert) space together...



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# Neil Julien Ross/Dalhousie University



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I hope to bring to the workshop some knowledge of quantum programming languages and quantum circuits.

My favourite movie is “In the mood for love”. I don’t think it has anything to do with quantum computing.



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# Amr Sabry/Indiana University



I hope to bring interest in quantum information flow and quantum logic as foundations for programming and reasoning.

I don't know about a "favorite" movie but how about "The Truman Show" as something lightheartedly relevant to this workshop.

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# Peter Selinger/Dalhousie University



Hopefully I can bring some ideas about type-safe quantum programming languages and quantum circuits

My favorite movie is “Lord of the Rings”. It is related to quantum computing because matrices form a ring.



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# Jake Taylor/OSTP



I hope to better understand how we can create a quantum-smart workforce across disciplines and expand American leadership in QIS

Favorite movie: If stuck in on a desert island, "The Martian". If stuck in a time loop, "Arrival".  
If just for fun, any Branagh Shakespeare



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# Himanshu Thapliyal/University of Kentucky



I hope to bring discussion on resource efficient design of quantum arithmetic circuits for scientific applications.

Favorite Movie: Moneyball (a good example of statistics)



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# Jeff Thompson/Princeton University



New platforms for QC, modular/hybrid systems with photons

QM Movie: I'm holding out for a movie that involves quantum mechanics the way *Interstellar* involved general relativity. Who will be our Kip Thorne?



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# Helen Wright/CCC



I hope to learn more about quantum computing while encouraging everyone to think of next steps (and perhaps get some good movie recommendations as well).



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# Xiaodi Wu/University of Maryland



I hope to bring ideas from quantum algorithms (optimization & machine learning), complexity (short-depth circuits), and programming languages to the discussion.

While I was thinking about Forrest Gump and the chocolate-box metaphor, I realize it has already been taken by someone else :)



VSD  
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# Jon Yard/University of Waterloo/Perimeter Institute



Hopefully I bring ideas and expertise in quantum information theory, number theory and algorithms.

Favorite movie:



Obvious relevance to quantum computing

# William Zeng/Rigetti Computing



What do you hope to bring to the workshop?

Experience building and designing full-stack quantum/classical hybrid computers and questions about how we can all make them useful as soon as possible.

What's your favorite movie and how is it related to quantum computing?

Paprika: dreams and multiverses are somehow quantum right?



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