Aron @ Columbia

The “early” years

…

Cyrus F. Hirjibehedin
MIT Lincoln Laboratory

Irene Dujovne
University of Massachusetts Amherst

Rui He
Texas Tech University

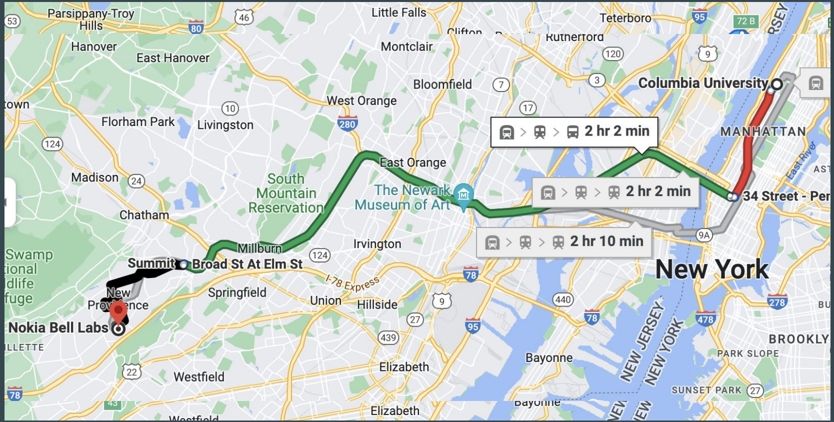
Columbia University

- Aron and Horst "moved" from Bell Labs to Columbia University in 1998
- We are the first of his graduate students at Columbia University:
  - Cyrus Hirjibehedin
  - Irene Dujovne
  - Rui He
  - Jun Yan
  - Trevor Rhone
  - Sheng Wang
  - Antonio Levy
  - Ziyu Liu
- There were also post-docs and many undergraduate and visiting students

Apologies if we are missing someone

Bell Labs, Murray Hill, NJ

Photo by John Gates courtesy UCSC

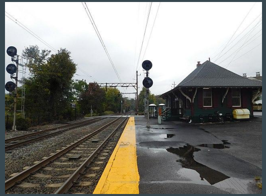


Courtesy Google Maps

116th Street Station

Penn Station

Summit Station



Murray Hill Station

Images courtesy Wikipedia

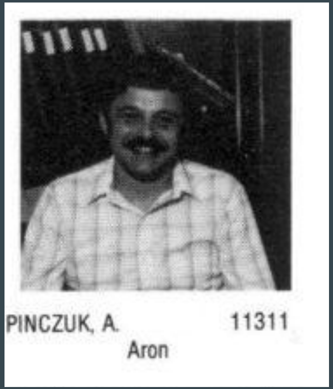
The privilege of working at Bell Labs

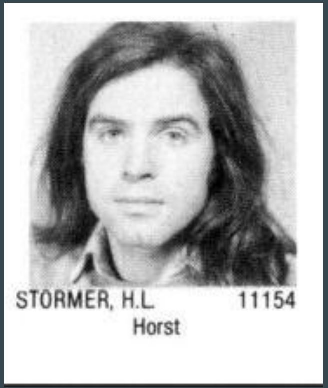
- Never-ending hallways of research labs with world-class research staff who were very friendly to graduate students

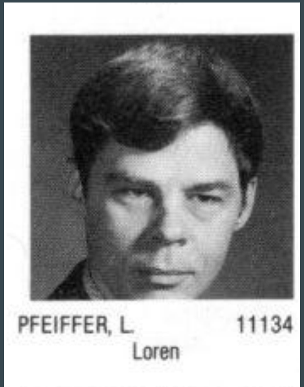
- Stimulating lunchtime conversations with people from across the lab

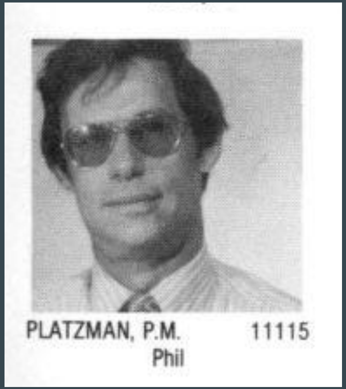
- Lively discussions at seminars

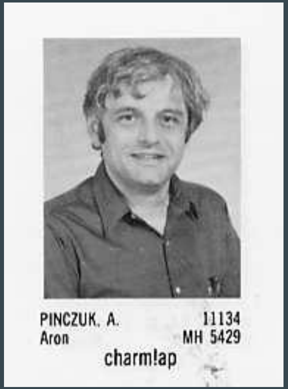
Bell Labs Pictorial Directory

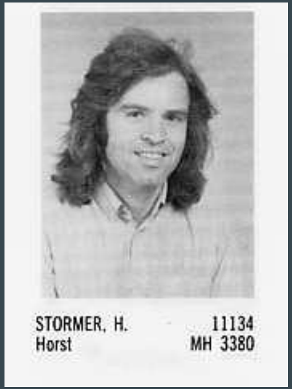


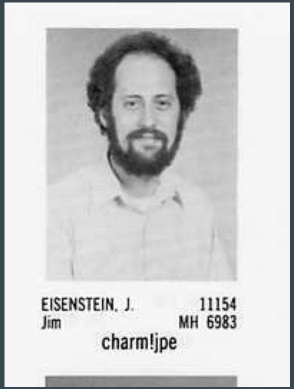


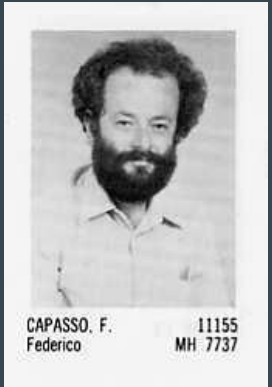




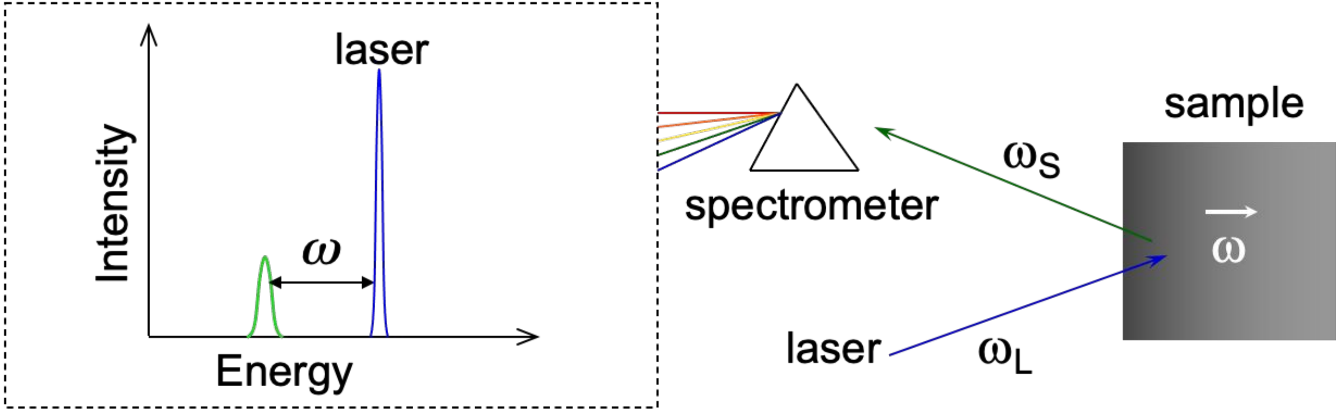








Inelastic Light Scattering

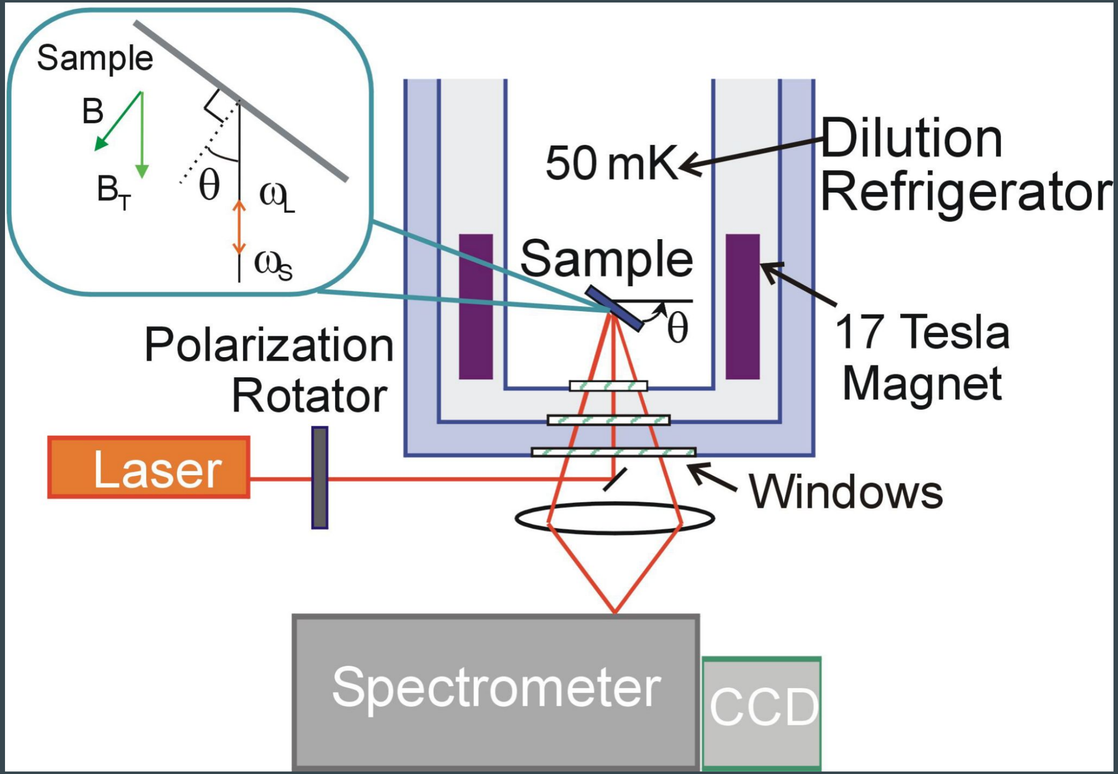


Conservation of Energy: $\omega = \omega_L - \omega_S$

Conservation of Wavevector: $k = k_L - k_S$

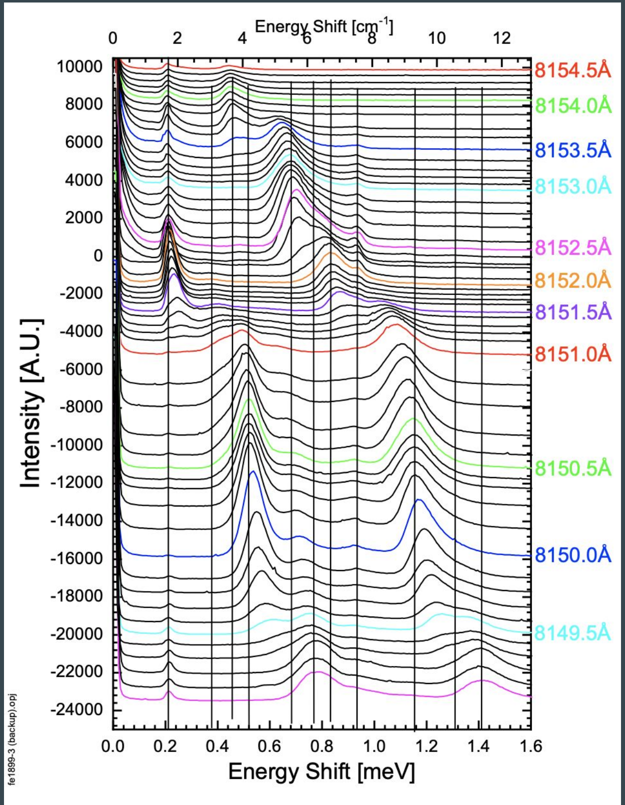
Light scattering probes the dispersive excitations of many physical systems

Aron the experimentalist: keep it simple



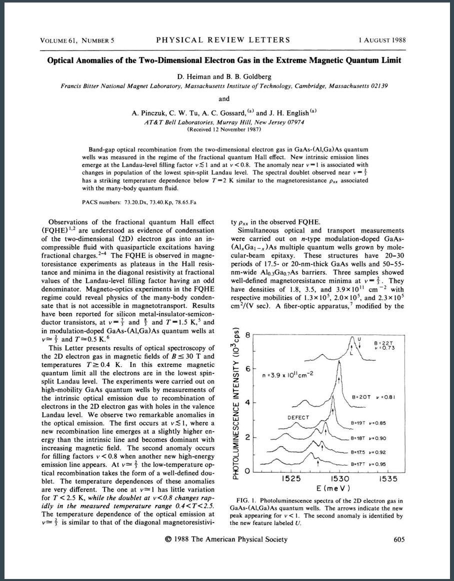
- “Simple” experimental setup
- Paper copies of all spectra (held up to the light to see changes)!
- Just get the data!

Aron the data analyst: never stop analyzing



- GaAs/AlGaAs 2DEG sample 1-08-97.1 grown by Loren Pfeiffer and Ken West
- Data acquired over a two-day resonance scan started on Feb. 18, 1999
- Never stop analyzing data
- Sometimes you have a question and look for the answer, and sometimes you have the answer (data) and look for the question

Writing papers


VOLUME 61, NUMBER 5 — PHYSICAL REVIEW LETTERS — 1 AUGUST 1988

Optical Anomalies of the Two-Dimensional Electron Gas in the Extreme Magnetic Quantum Limit

D. Heiman and B. B. Goldberg

Francis Bitter National Magnet Laboratory, Massachusetts Institute of Technology, Cambridge, Massachusetts 02139

and

A. Pinczuk, C. W. Tu, A. C. Gossard,[a] and J. H. English[a]

AT&T Bell Laboratories, Murray Hill, New Jersey 07974

(Received 12 November 1987)

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Remarkable!


PHYSICAL REVIEW LETTERS **126,** 106402 (2021)

Observation of Flat Bands in Gated Semiconductor Artificial Graphene

(Received 17 October 2020; accepted 15 February 2021; published 12 March 2021)

DOI: 10.1103/PhysRevLett.126.106402

0031-9007/21/126(10)/106402(5) — 106402-1 — © 2021 American Physical Society

Intriguing!


PRL **98,** 166802 (2007) — PHYSICAL REVIEW LETTERS — week ending 20 APRIL 2007

Electric Field Effect Tuning of Electron-Phonon Coupling in Graphene

Jun Yan,[1] Yuanbo Zhang,[1] Philip Kim,[1] and Aron Pinczuk[1,2]

(Received 22 December 2006; published 18 April 2007)

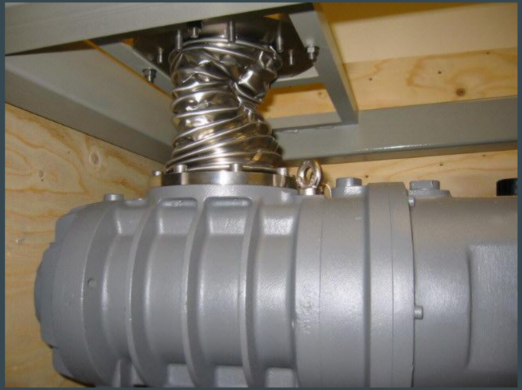
DOI: 10.1103/PhysRevLett.98.166802

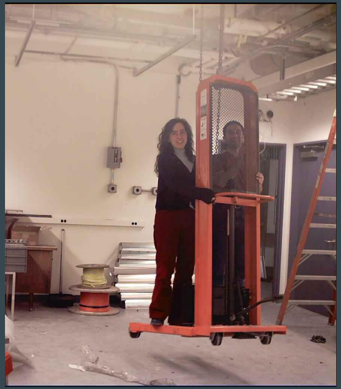
0031-9007/07/98(16)/166802(4) — 166802-1 — © 2007 The American Physical Society

Venue!

Building a new lab at Columbia

Setting up a lab is hard work

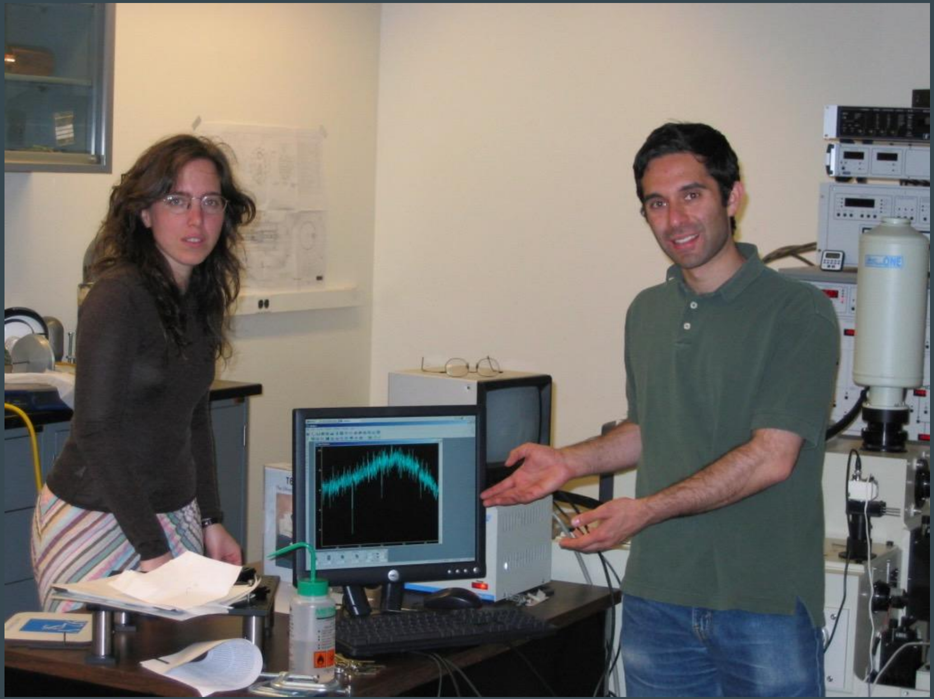




- Before you can fill a lab, you have to empty it
- Accidents happen, especially in shipping
- Be friendly with service engineers
- Testing is crucial

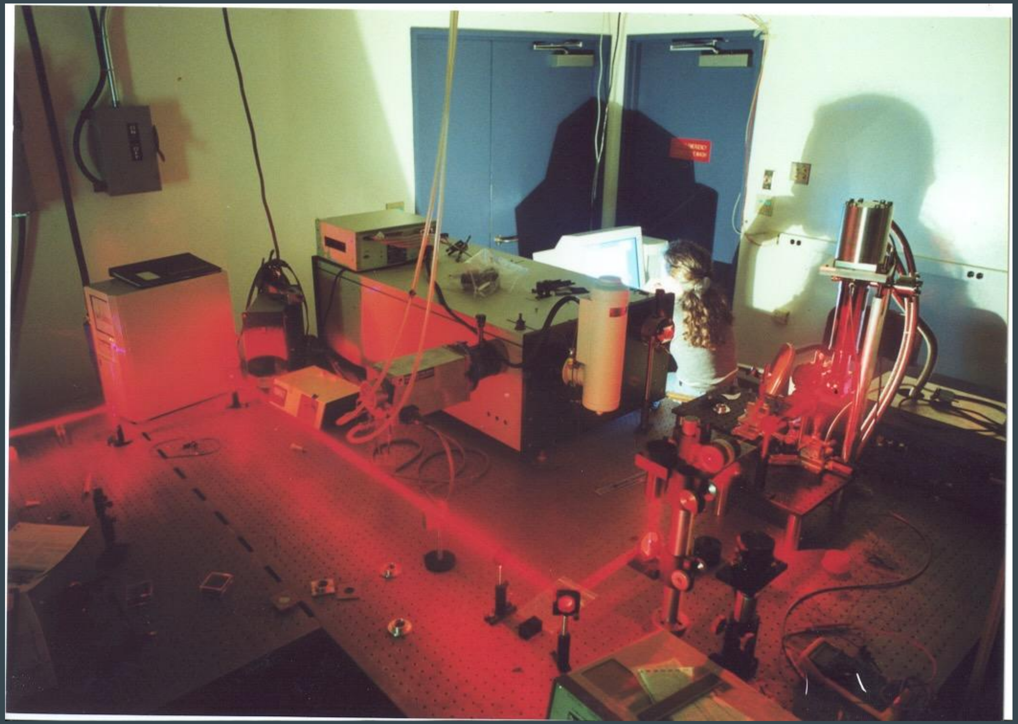
Hard work pays off

Early 2004?



Now we can graduate?!

Aron the negotiator



- Always ask suppliers for discounts … again and again and again!
- Free is even better!

Aron the teacher: deadlines are optional

Solid State Physics
G6081, Fall 2001
Homework 4
Due October 10, 2001

Problem 1

Show that Bravais lattices that incorporate rotation axes $\phi_n = 2\pi/n$ with n=5 do not exist. Interpret this mathematical result.

Problem 2

Consider the conventional unit cell of an ortorhombic structure ($a \neq b \neq c$ and $\alpha=\beta=\gamma=\pi/2$) of side a= 2, b= 3, c=4. What is the distance between planes of the family {112}

Problem 3

Consider the bcc structure with every lattice point occupied by the same kind of atom. How will the allowed Bragg reflections, (h,k,l) be affected as the coordinates of the body-centered atom change from

$$\frac{1}{2},\frac{1}{2},\frac{1}{2} \text{ to } \frac{1}{2n},\frac{1}{2n},\frac{1}{2n}$$

assuming n is a positive integer? Do the calculation for n=2.

Problem 4

Is the honeycomb net a Bravais lattice? Why? (see fig 4.17 of Ashcroft-Mermin)

Problem 5

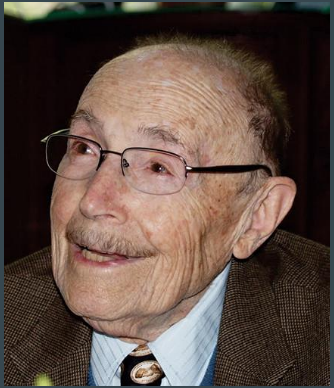
a) Show that the reciprocal of the reciprocal lattice is a direct lattice
b) Show that the reciprocal lattice of a BCC is FCC and vice-versa

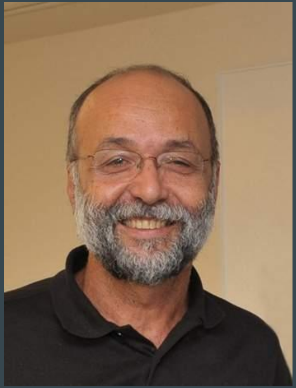
Problem 6

Construct the reciprocal lattice of the square lattice and the hexagonal lattice

Aron the motivator: chocolate

Aron’s network





Aron the traveler

We were lucky and were able to join several international conferences

CEPSR 9th Floor Community: the Golden Age

Aron the proud advisor

Aron’s impact on our careers: Cyrus

COLUMBIA UNIVERSITY IN THE CITY OF NEW YORK

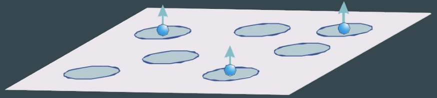
Lucent Technologies Bell Labs Innovations

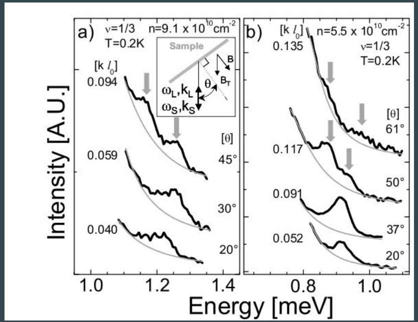
IBM

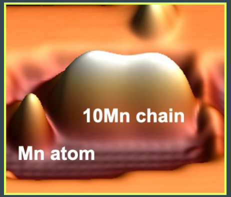
UCL University College London

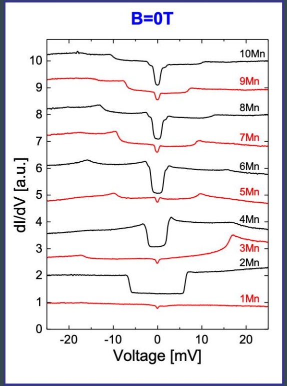
LCN LONDON CENTRE FOR NANOTECHNOLOGY

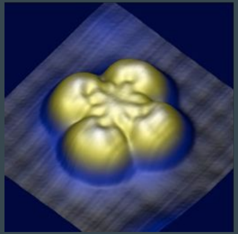
LINCOLN LABORATORY MASSACHUSETTS INSTITUTE OF TECHNOLOGY

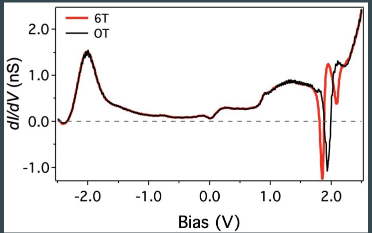


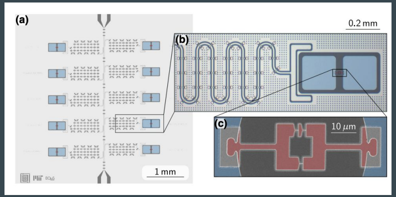


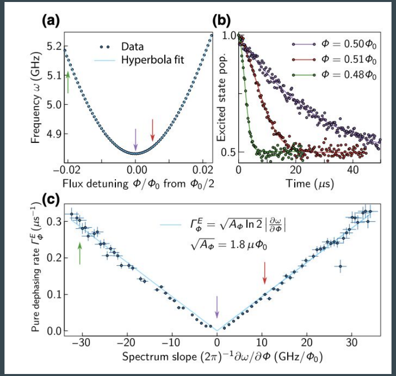






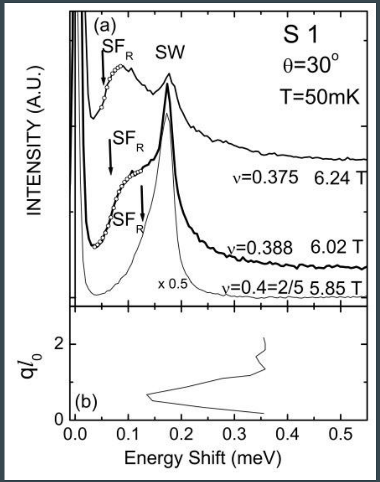


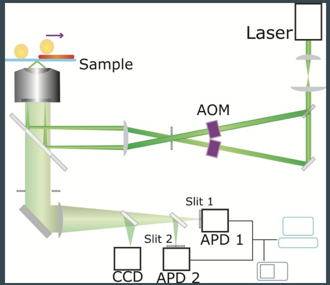


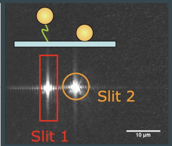


Spectroscopy has been a common thread through many different fields of study

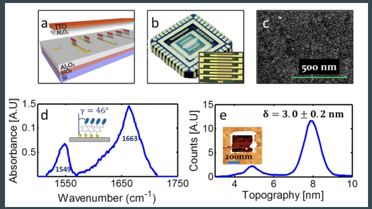
Aron's impact on our careers: Irene



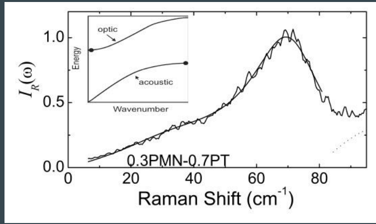




TU Delft
Delft University of Technology

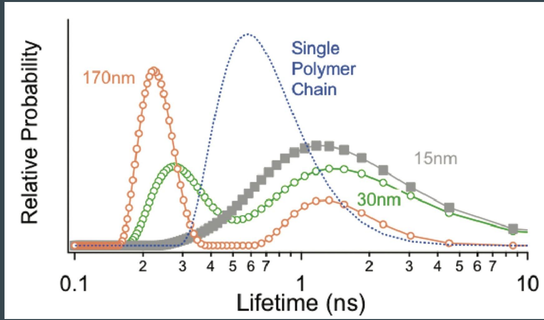


UMass Amh



COLUMBIA UNIVERSITY
IN THE CITY OF NEW YORK

Lucent Technologies
Bell Labs Innovations



Optics has been a common thread through many different fields of study

Aron's impact on our careers: Rui

Graduate student 2002-2006

Columbia University

Postdoc 2009-2011

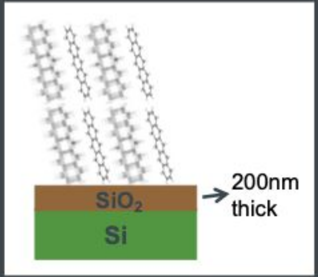
Columbia University

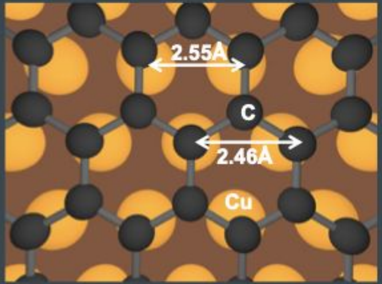
2011-2017

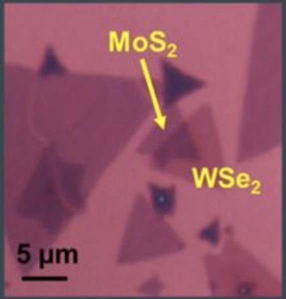
UNI / University of Northern Iowa

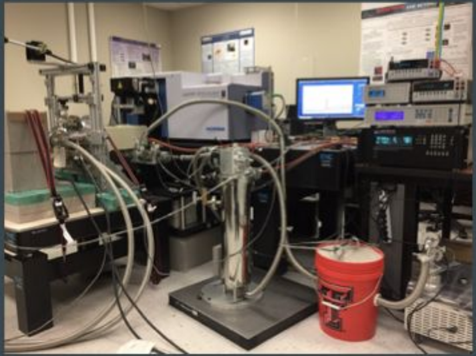
2017-now

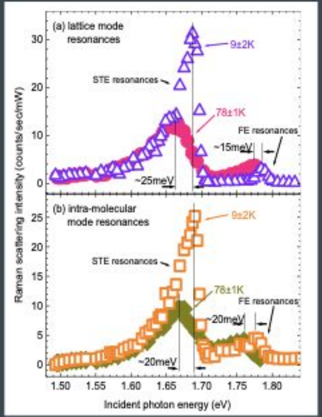
Texas Tech University

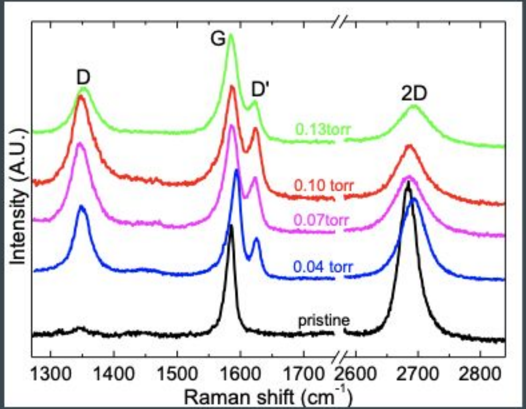


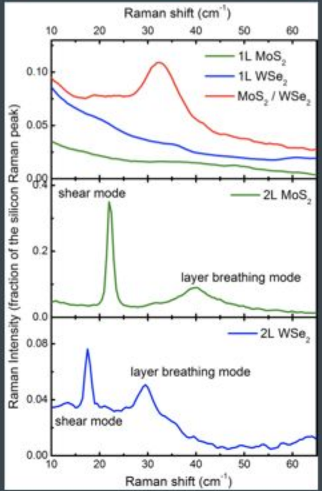


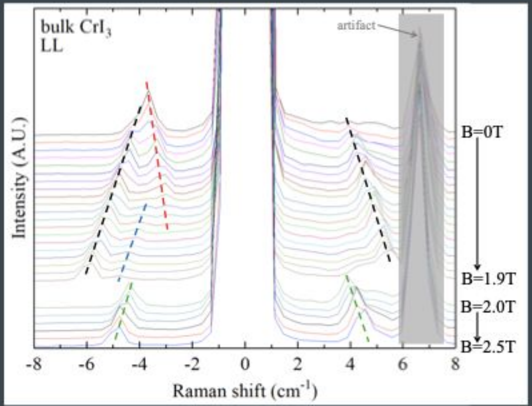












Around the world

2006 ID met Aron and Glayds in Amsterdam

June 8, 2009 Rui met with Aron and Gladys in Beijing, China.

Aug. 27, 2007 Cyrus met with Aron in Los Gatos, CA

Aug. 29, 2013 Cyrus met with Aron and Gladys in London, UK

Aron the supporter

Thank you, Aron!

We will miss you!