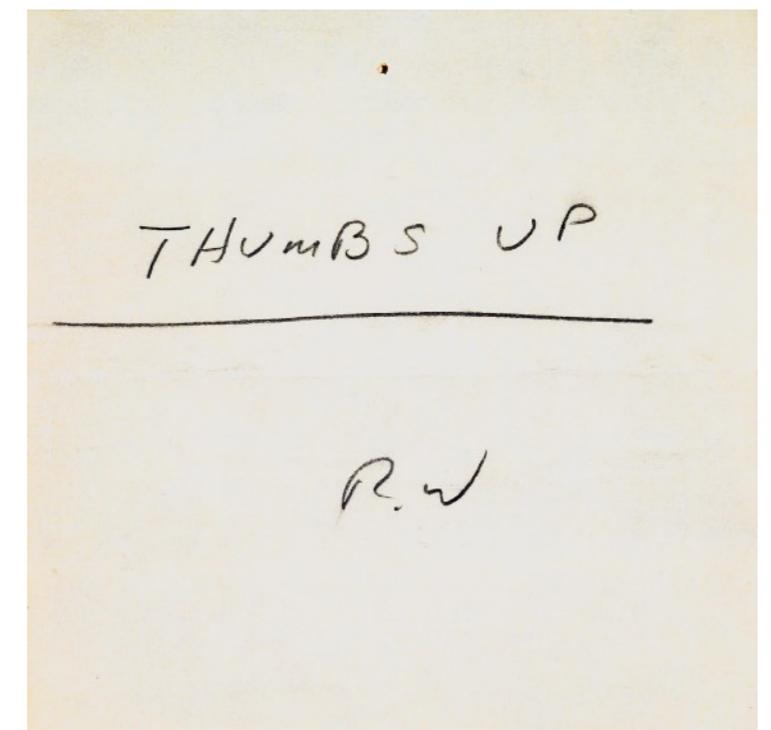


The Weiss hands-on pre-school for people who want to measure small things well: building 20 in the 1980s and 90s

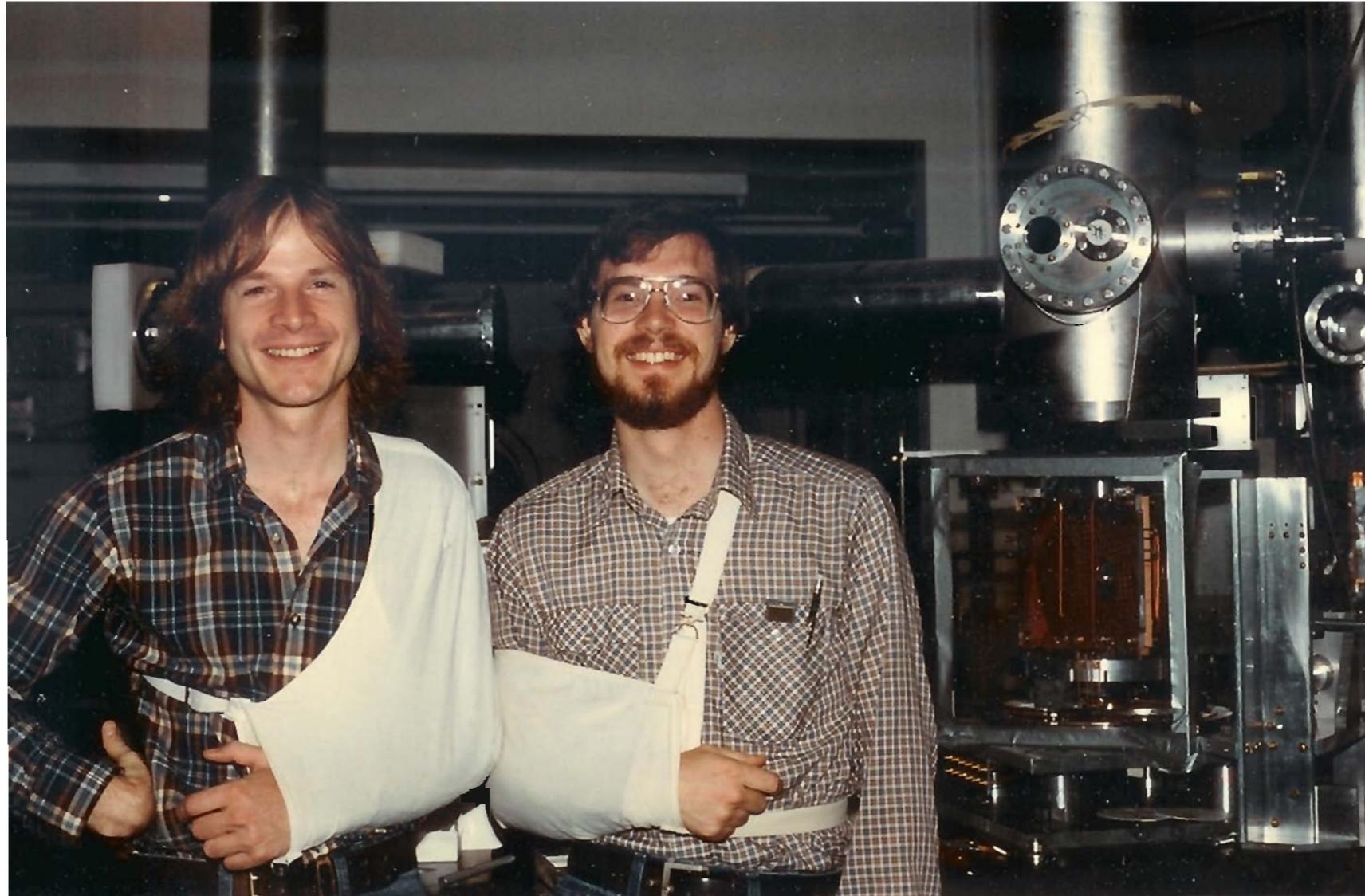
Joe Giaime, February 2026



Why did Rainer Weiss's lab work so well?

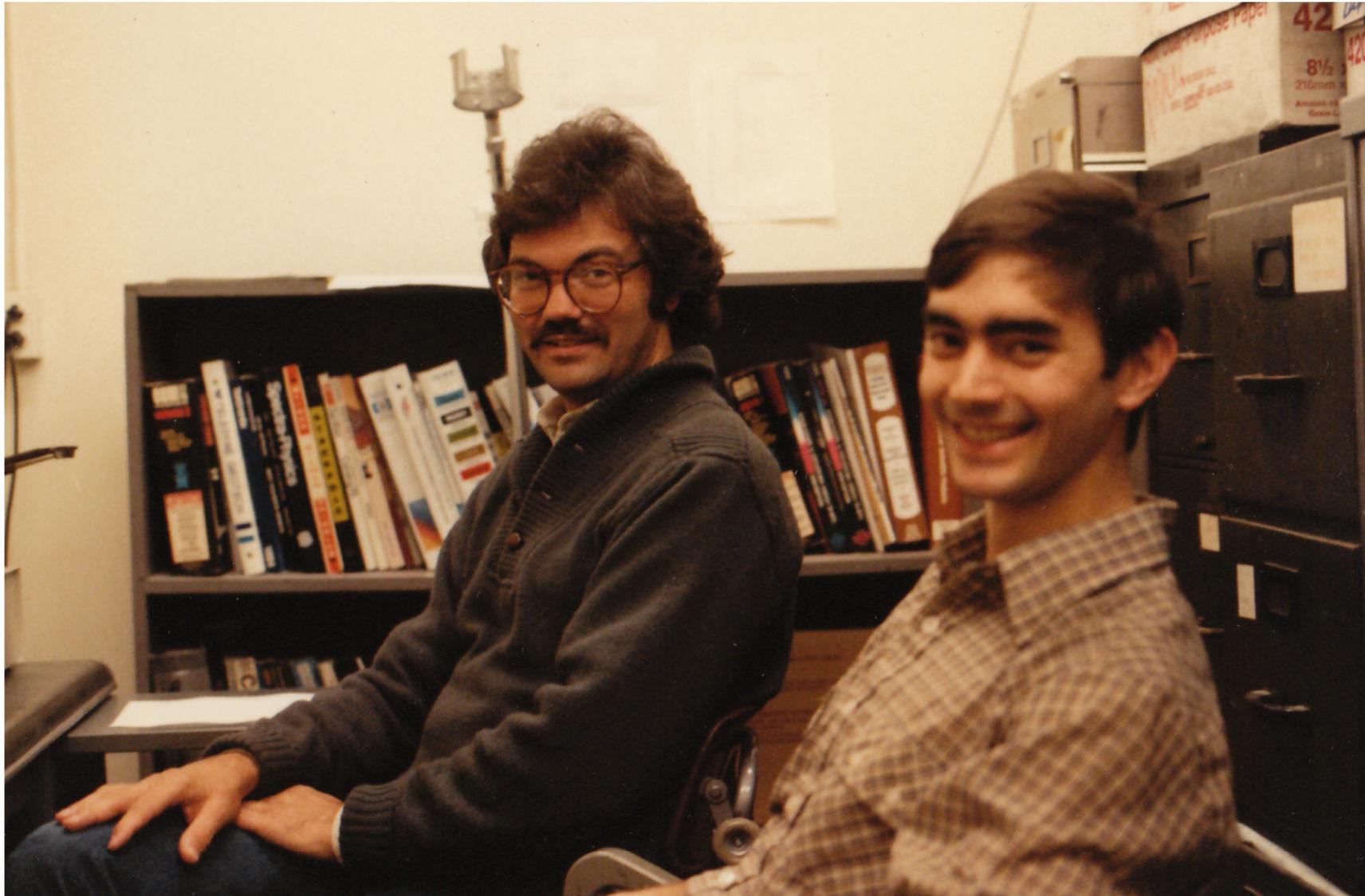
- Rai was personally interested in each student's progress.
- Rai helped us with our problems, including providing ether to start old cars and convening his own version of Reform School for those of us who had lossy collisions with the general exams.
- He respected everyone who worked, leading to all of us respecting and helping each other.
- From time to time, most of us would be treated to a sheaf of paper in RW's special handwriting that addressed the experiment we were building or that confused us.
- We had well stocked mechanical & electronic shops, and decades of slightly used instruments.
- Instead of buying them, we made our own optical table dogs in the shop, which fortified our souls, at least for a few years.
- RW had only nice things to say about theorists.

Cosmology & Gravitation



- COBE, balloon and terrestrial infra-red measurements of the CBR: Steve Meyer, Patricia Downey, Mark Halpern, Andrew Jeffries, Ed Cheng, Richard Benford, ...

Cosmology & Gravitation



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Cosmology & Gravitation



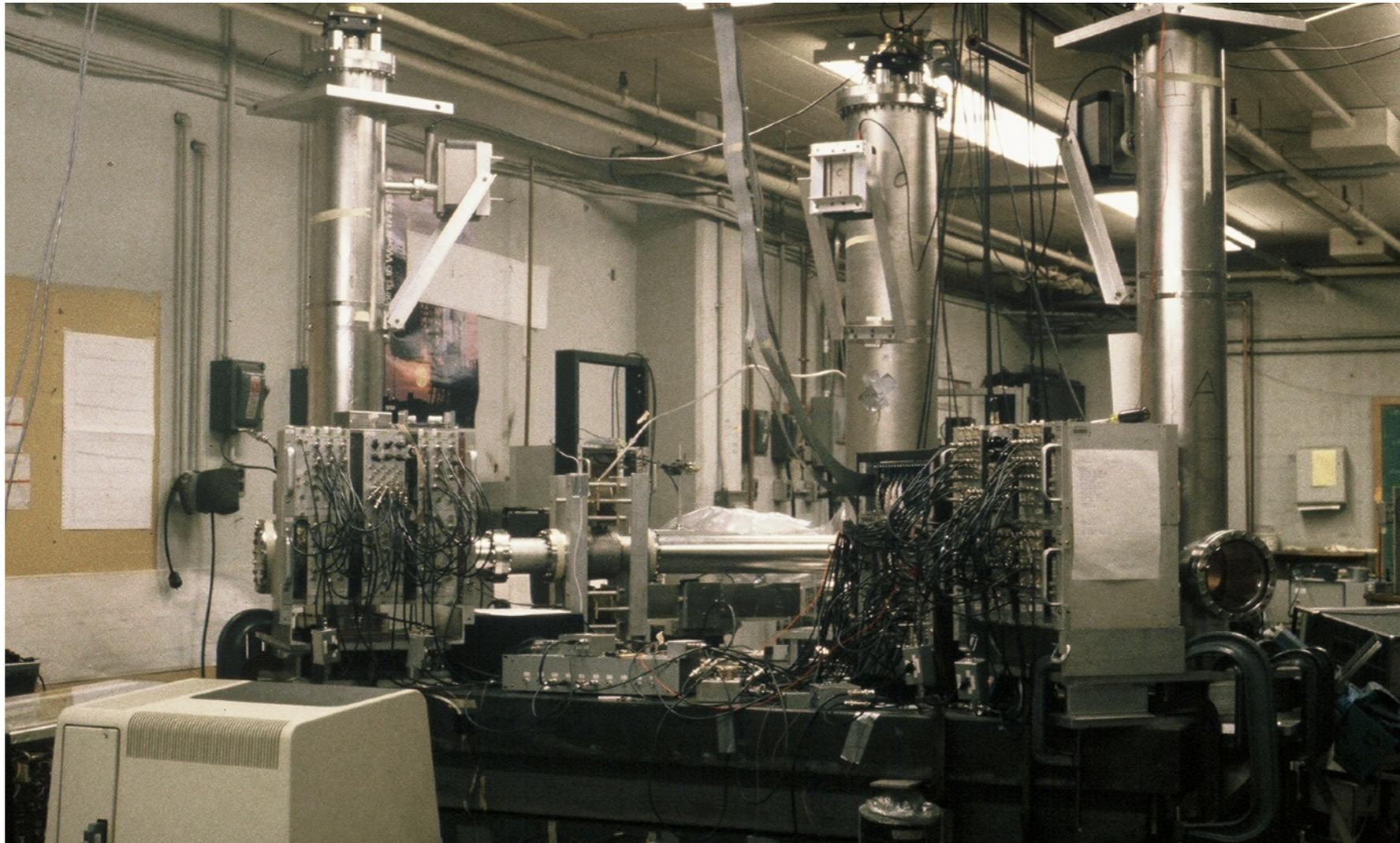
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Cosmology & Gravitation



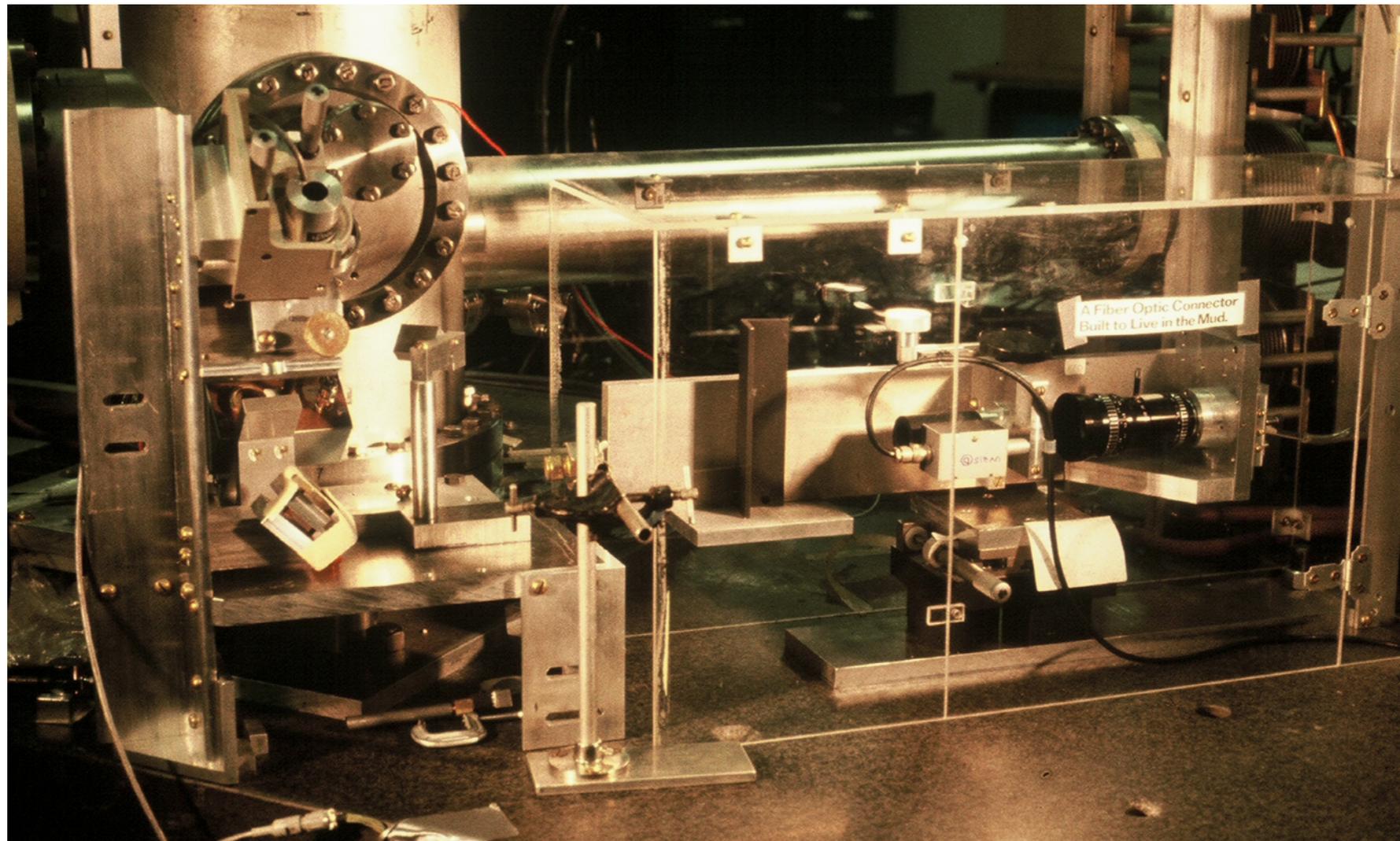
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1.5 m 'prototype' delay line GW detector



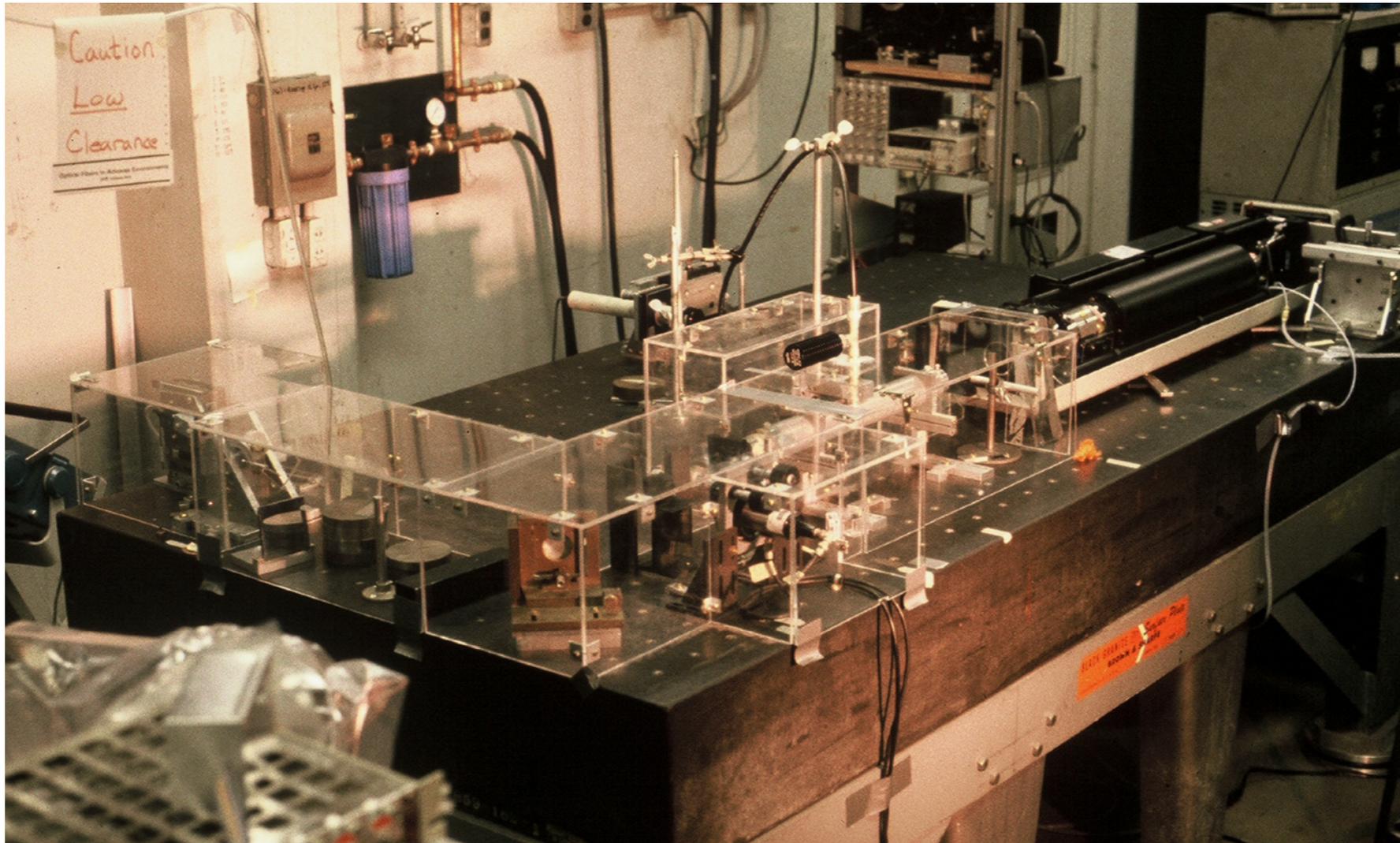
- in play roughly 1976 - '87. Peter Kramer, Richard Benford, David Shoemaker, Dan Dewey, Jeff Livas, Christensen, etc. Set actual upper limits, and its students were inspired by Rai to take its data seriously and carry out sophisticated analyses.
- Capacitive sensor/drive, pneumatic seismic isolation, compound mass suspension, digi-mod whitened light, Ar ion laser, Air Force granite table.
- Last hurrah was brief run right after SN87a. No signal seen, but we kids were impressed.

1.5 m 'prototype' delay line GW detector



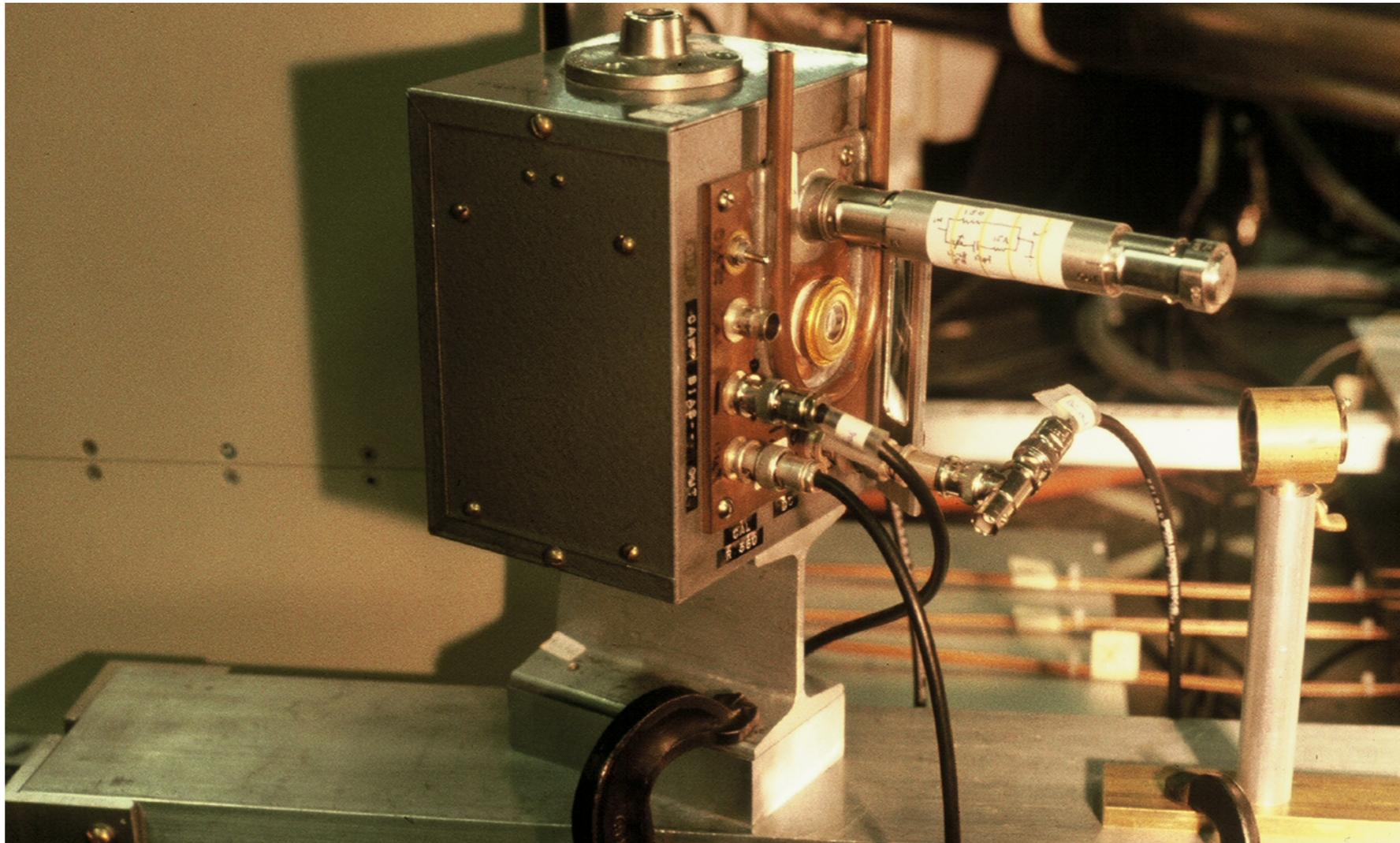
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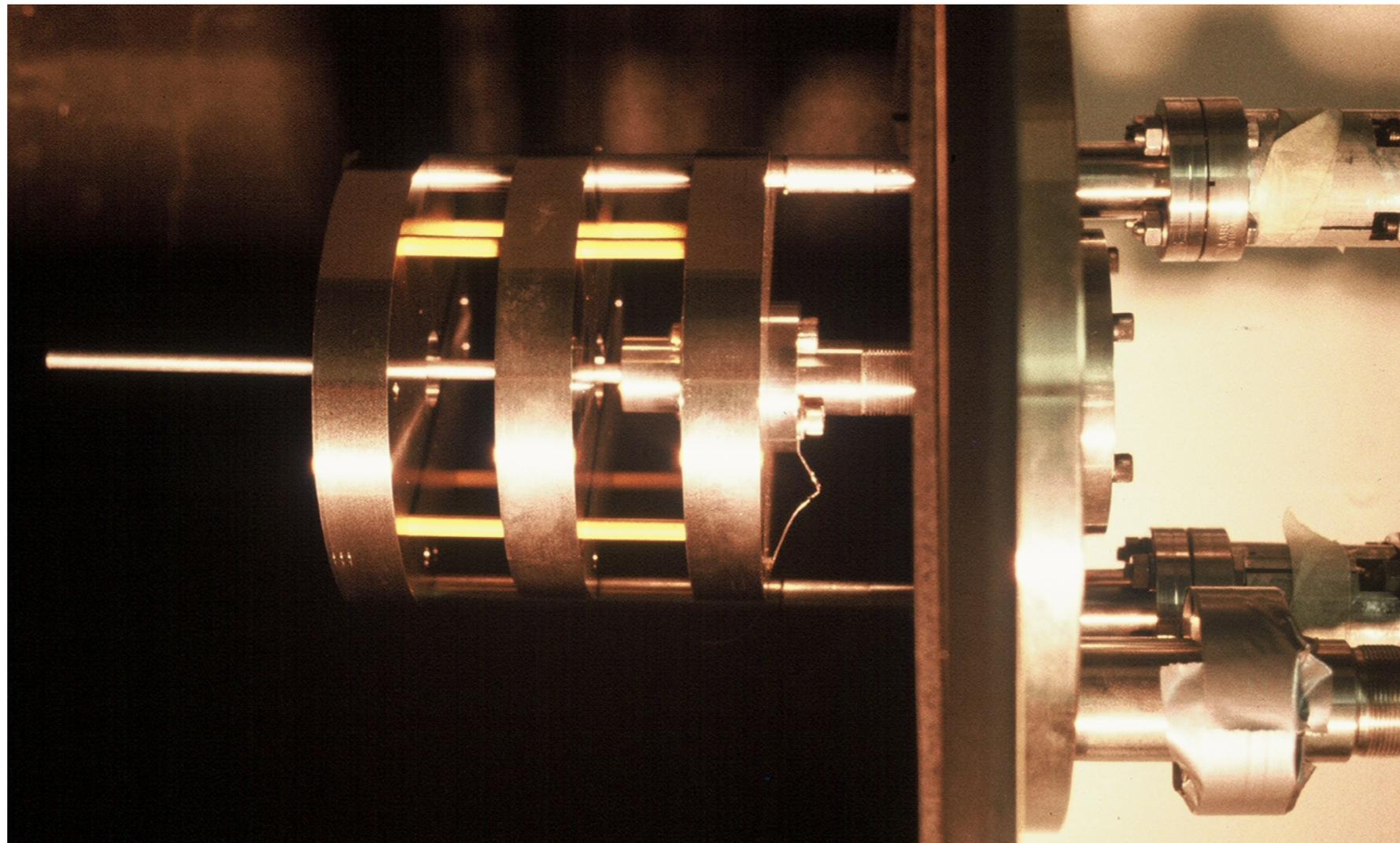
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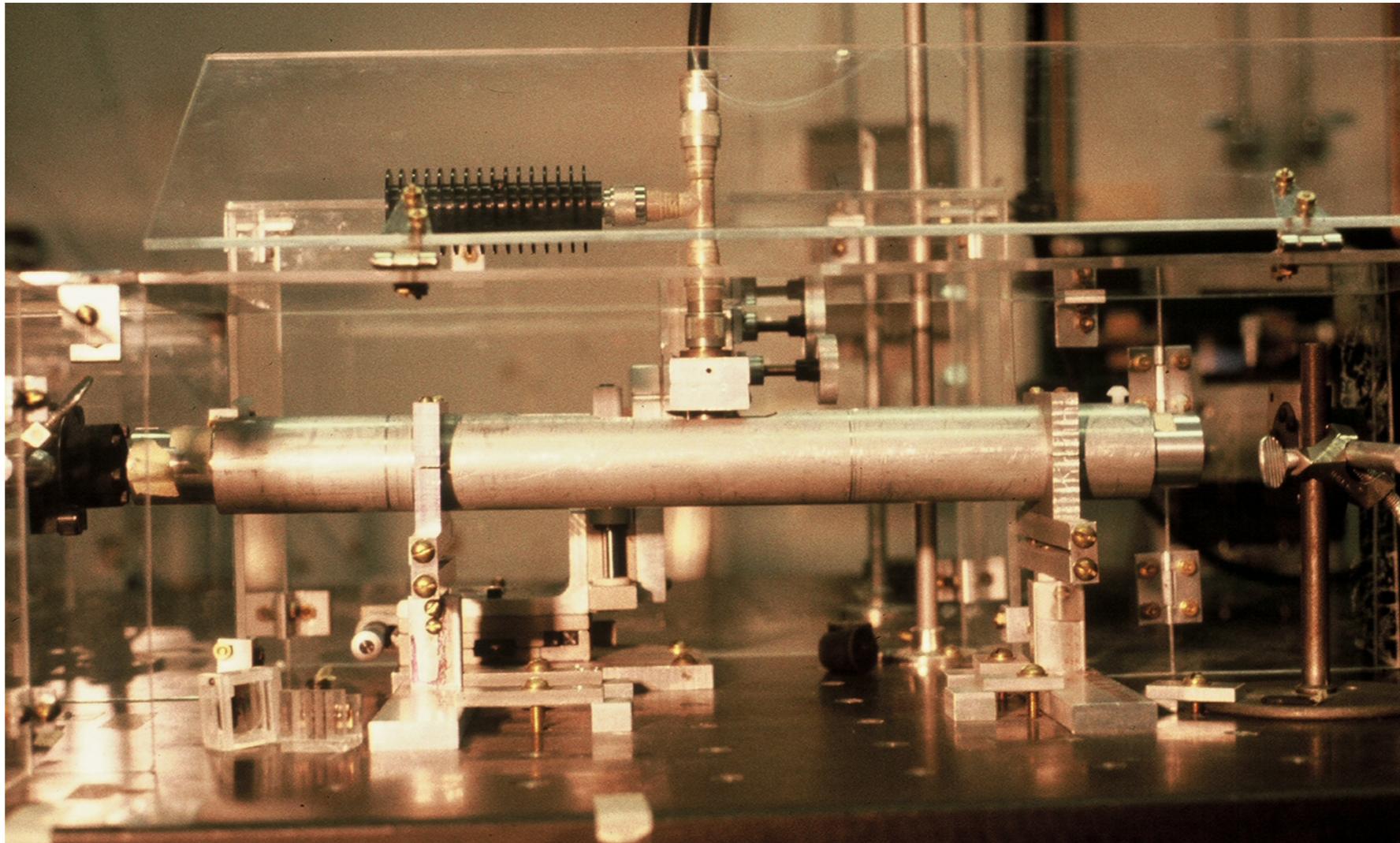
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meter-scale LIGO R&D in the late 80s–90s



- LIGO-related tests in meter-scale vacuum system: solid state lasers, test mass suspension, thermal noise, seismic isolation, interferometer sensing and control, etc.: Nelson Christensen, Mike Burka, Peter Fritschel, Joe Kovalik, Michelle Stevens, Joe Giaime, Partha Saha, Nergis M., Brian Lantz, Ed Daw, Richard Benford, Tom Evans and more...

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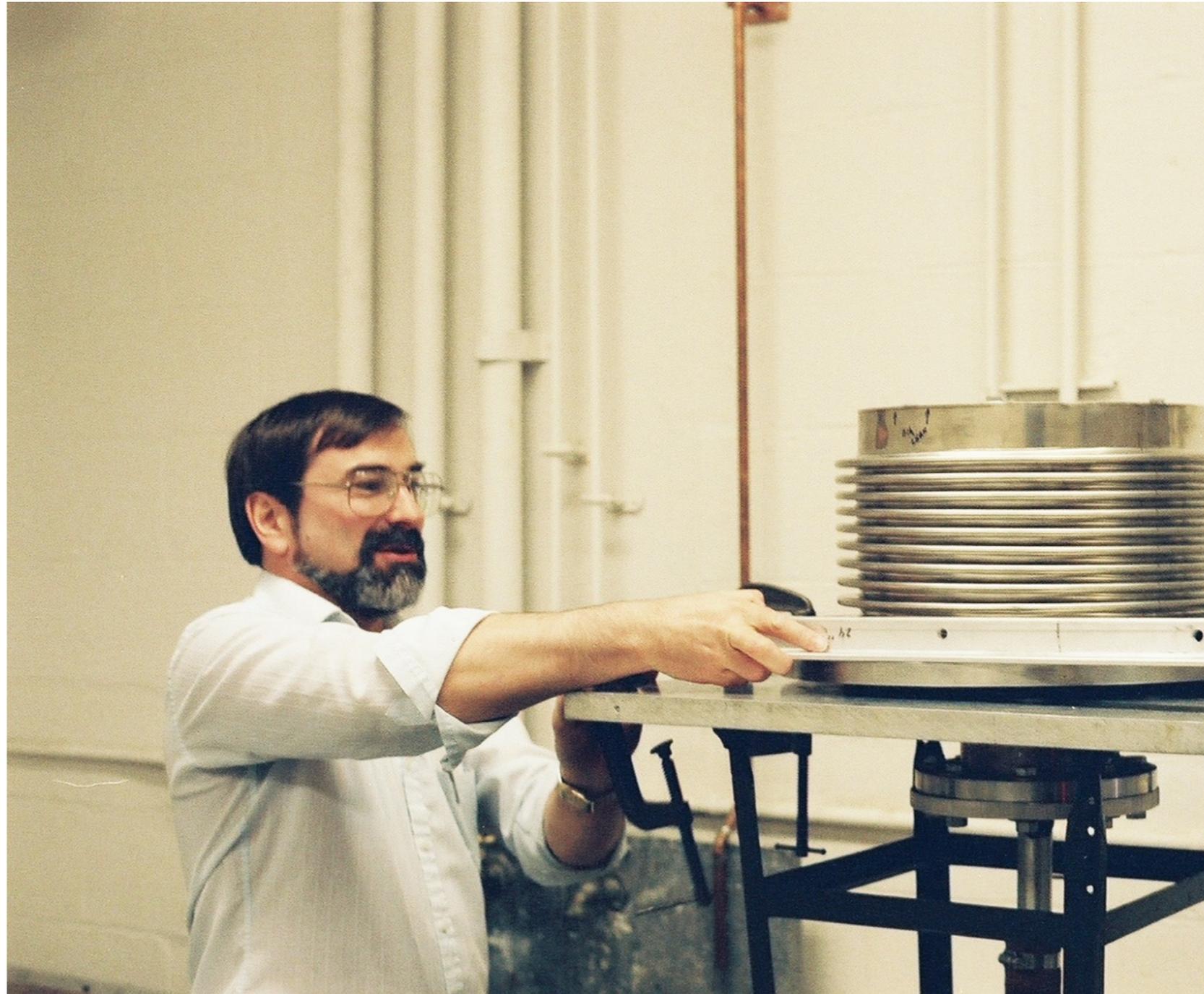
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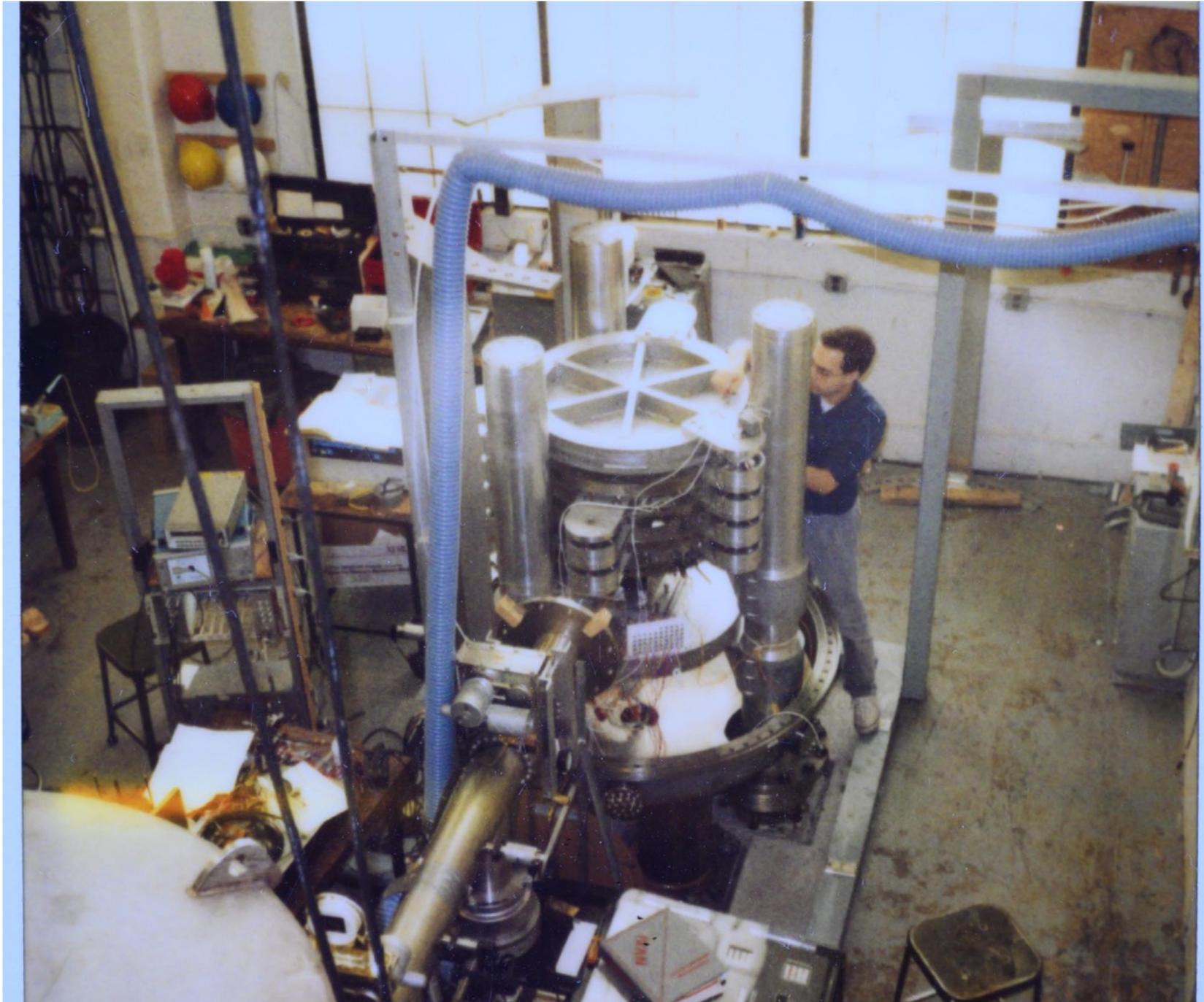
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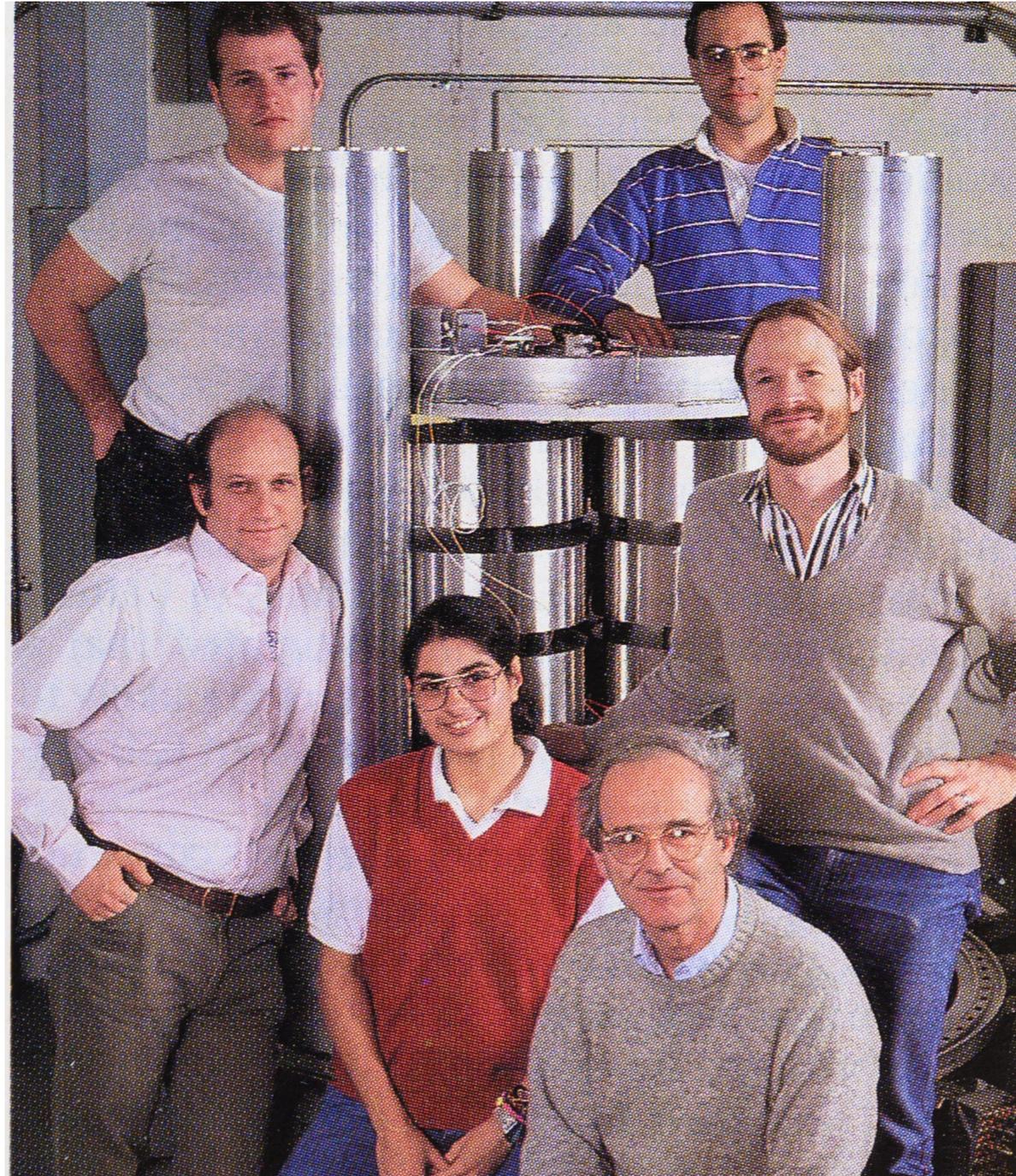
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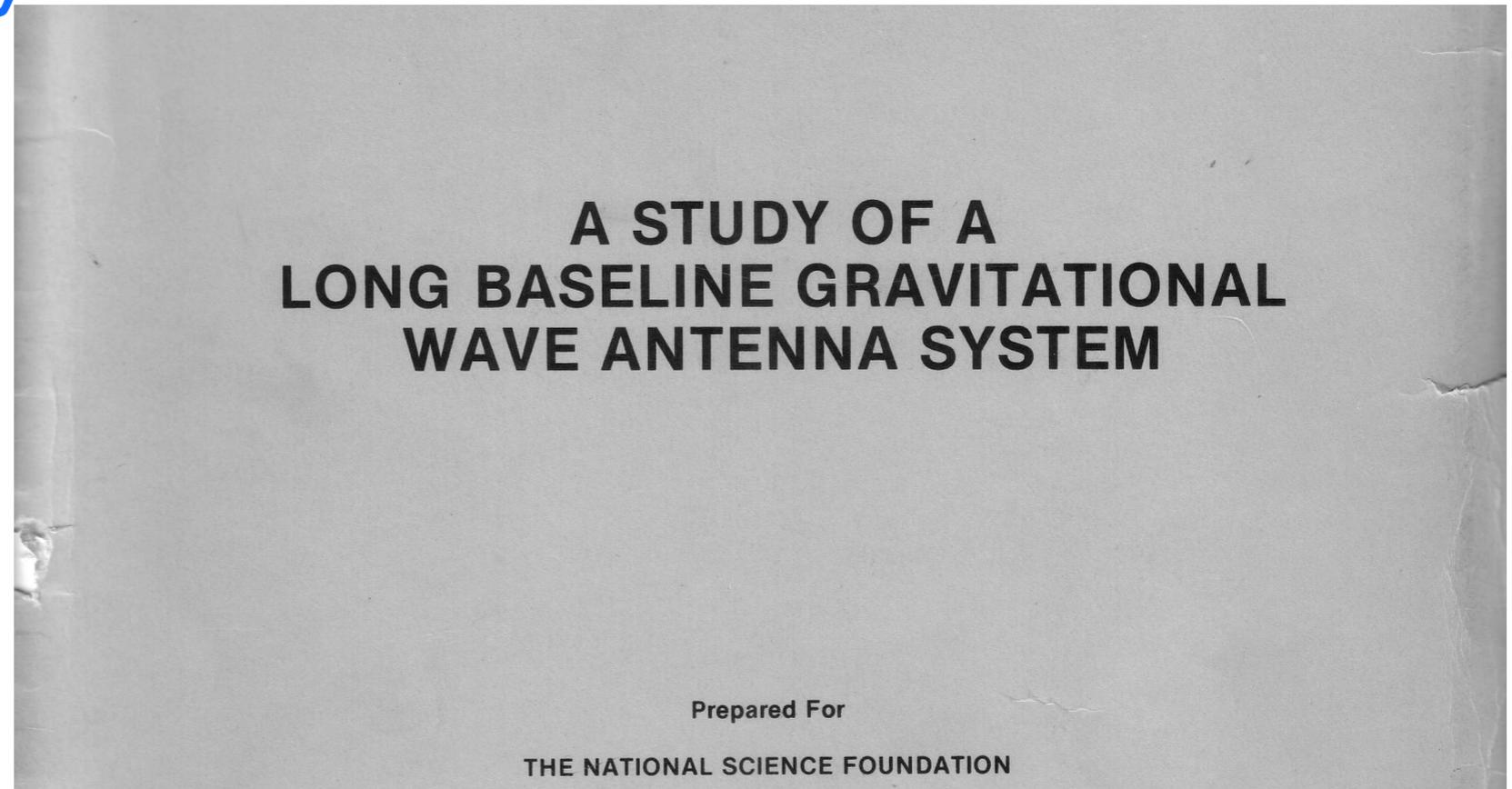


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Building 20 life



- Studies of Cost estimation and schedules among physicists:



8.3 Total Costs and General Remarks

The sum of the fixed and variable costs is listed in Table 9.12. As expected, Scheme 1 (without wind walls) is the least expensive, with the total varying from \$9.0 million for an antenna with 24" tubes to \$10.9 million for 36" tubing. Scheme 2 is next at roughly \$15.0 million, with Scheme 3 only slightly high than \$16 million. Because of uncertainty in mining cost and the size of the pre-existing mine which would be used, it seems fairest to quote the total cost for construction in a mine in a range from \$13.5 million to \$17.9 million.

Excerpts from thesis Acknowledgments

It has been a privilege to work with all of the members of the Gravitation and Cosmology Group; special thanks to Rai Weiss, Peter Saulson, Jeff Livas, and Richard Benford.

The work described in this thesis would not have been possible without the contributions of many people. The author is particularly indebted to Rai Weiss for many ideas and insights, as well as for help developing a style of research. In spite of many other obligations, Rai was also in the lab when he was needed, especially in the final stages of the experimental work.

I would like to thank my supervisor Rai Weiss whose relentless pursuit of scientific excellence has allowed me to investigate many different aspects of experimental physics.

This work is greatly indebted to Prof. Rainer Weiss for both its scientific content and flavor.

Acknowledgments

For the initial idea of doing these types of experiments, for regularly providing motivation and inspiration to do them, for instilling in me a love of basic research and a style of doing it, for supplying everything from six-shooters to the mother-of-all-programs, I thank my thesis advisor, Rainer Weiss.

many enlightening discussions on data analysis and statistics. Thank you Rai Weiss for getting me into this business and for providing perpetual inspiration.

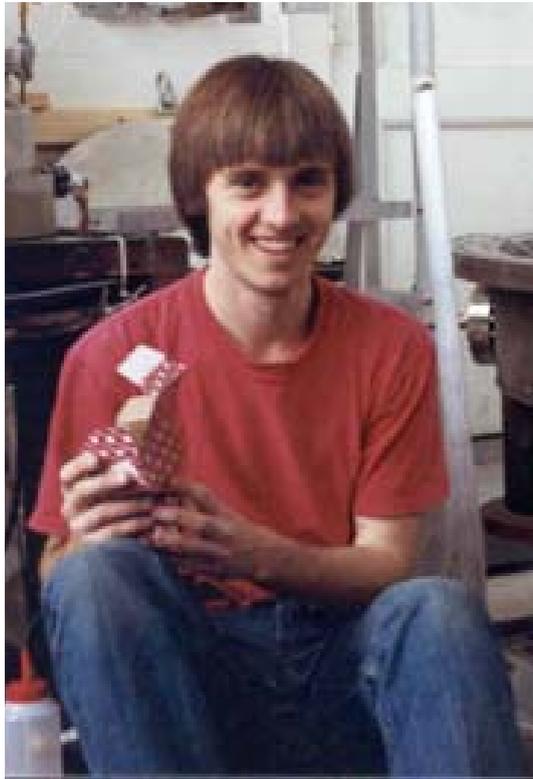
To Rai, who talked with me one Saturday morning and set me off in a new direction.

I thank Rai Weiss for motivation and guidance in this work and for Reform School; Peter Fritschel and Gabriela González for countless discussions and patient explanations on a variety of topics; David Shoemaker, Mike Zucker and Stan Whitcomb for scientific insights and for general support of our costly experimental (ad)ventures; and all my colleagues in the lab for their willing assistance and for creating an amicable and productive environment.

I would like to thank Rainer Weiss and all the members of the Gravitation and Cosmology Research Group with whom I've had the privilege to work, learn and laugh during the last eight years.

A simple mis-understanding

Epilog



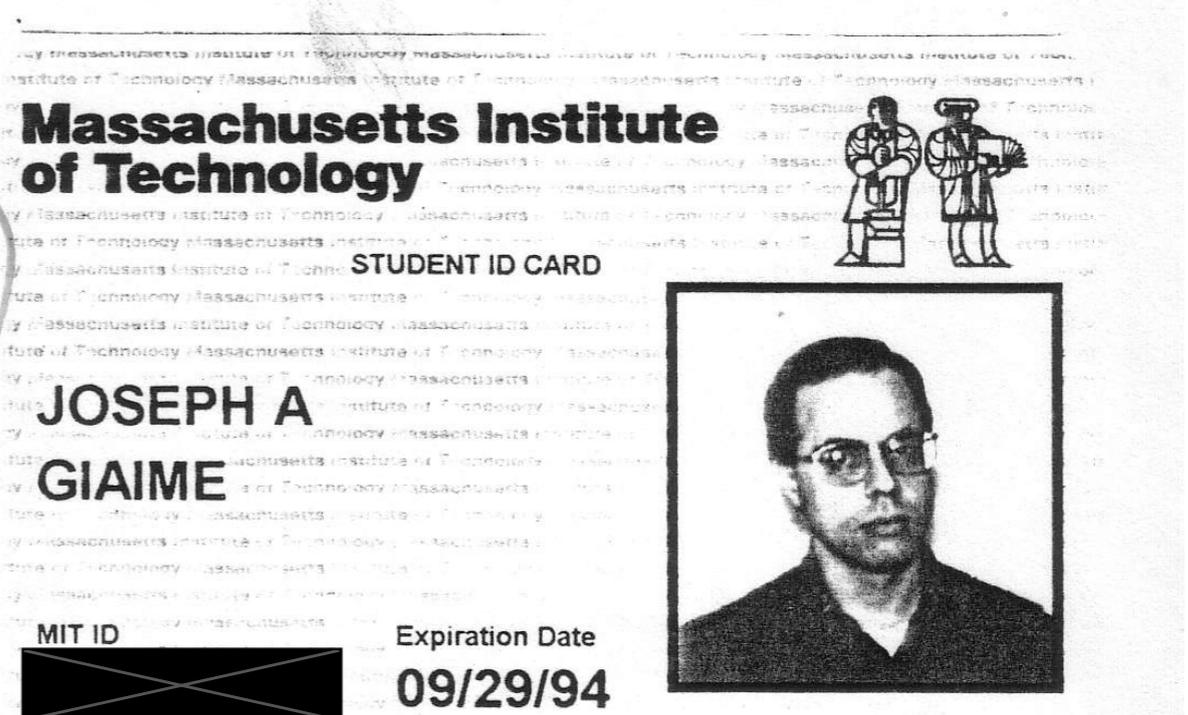
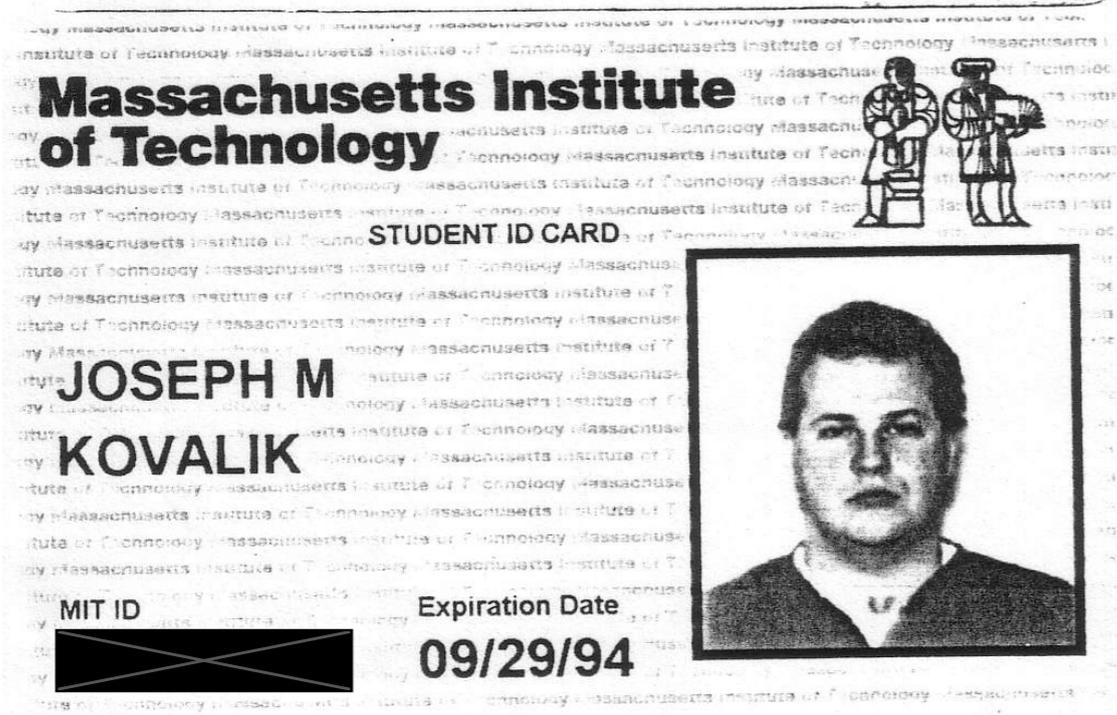
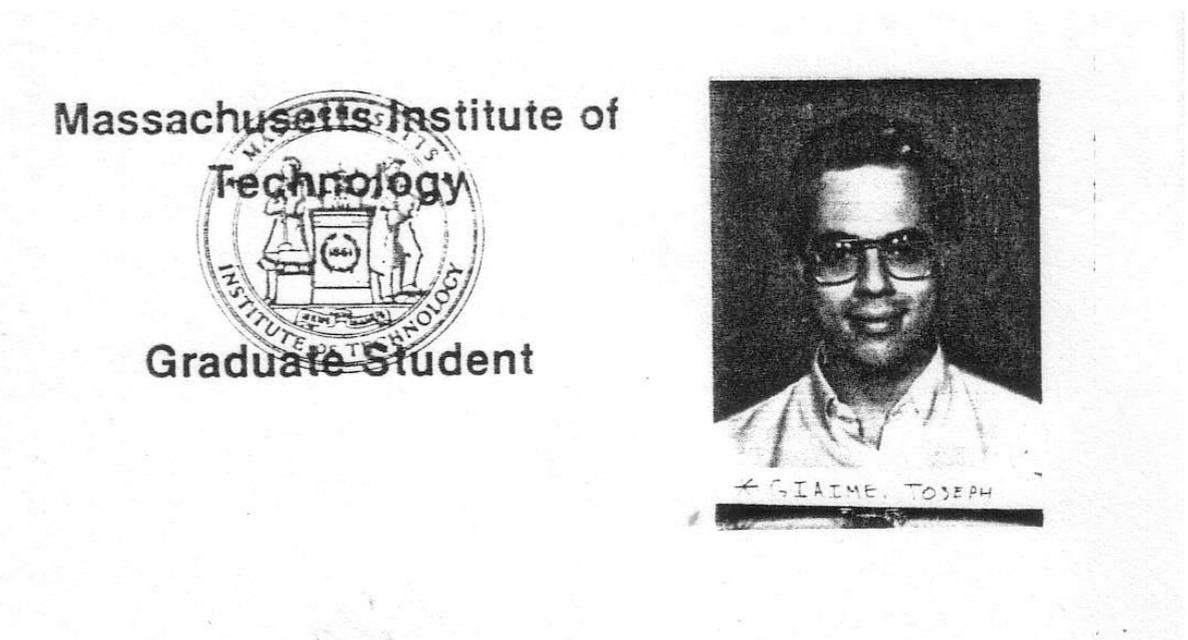
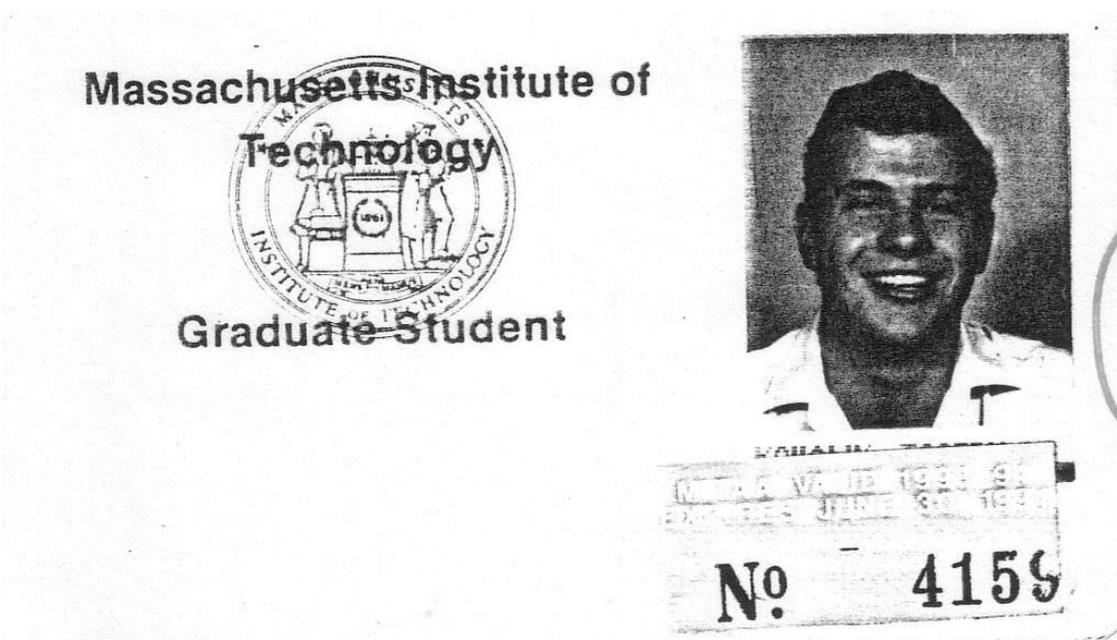
It is no secret that I did not enjoy my time at M.I.T. Never before have I experienced such a drain on my feelings and emotions. For whatever reason, the M.I.T. environment suppresses the ability and desire to laugh, cry, love, and enjoy the company of fellow humans. The concepts of basic human politeness and civility are absent. All interactions are strictly technical, the garnish to a meal being a spectral density, or some such thing. This environment is not normal, and I will not allow myself to be subjected to similar circumstances again.

The **situation at M.I.T. is not hopeless.** I have developed many friendships while I have been here. It has been a pleasure to spend some time and share a laugh with these friends. Rainer Weiss has been a unique advisor. His unpretentious and straightforward style are refreshing. There are a number of malicious, cruel, and even sinister professors at M.I.T., and I was fortunate to work for someone who was on the level.

- Nelson Christensen, after becoming an expert in fiber polishing (we were going to use fibers as mode cleaners), he wrote a fine thesis on the detection of stochastic sources
- In Rai's language, "not hopeless," or, "not completely hopeless," means that the item in question is sensible and potentially a great success.
- What Rai and others failed to notice at the time was that Nelson had begin using Rai's diction, as had many of his students.

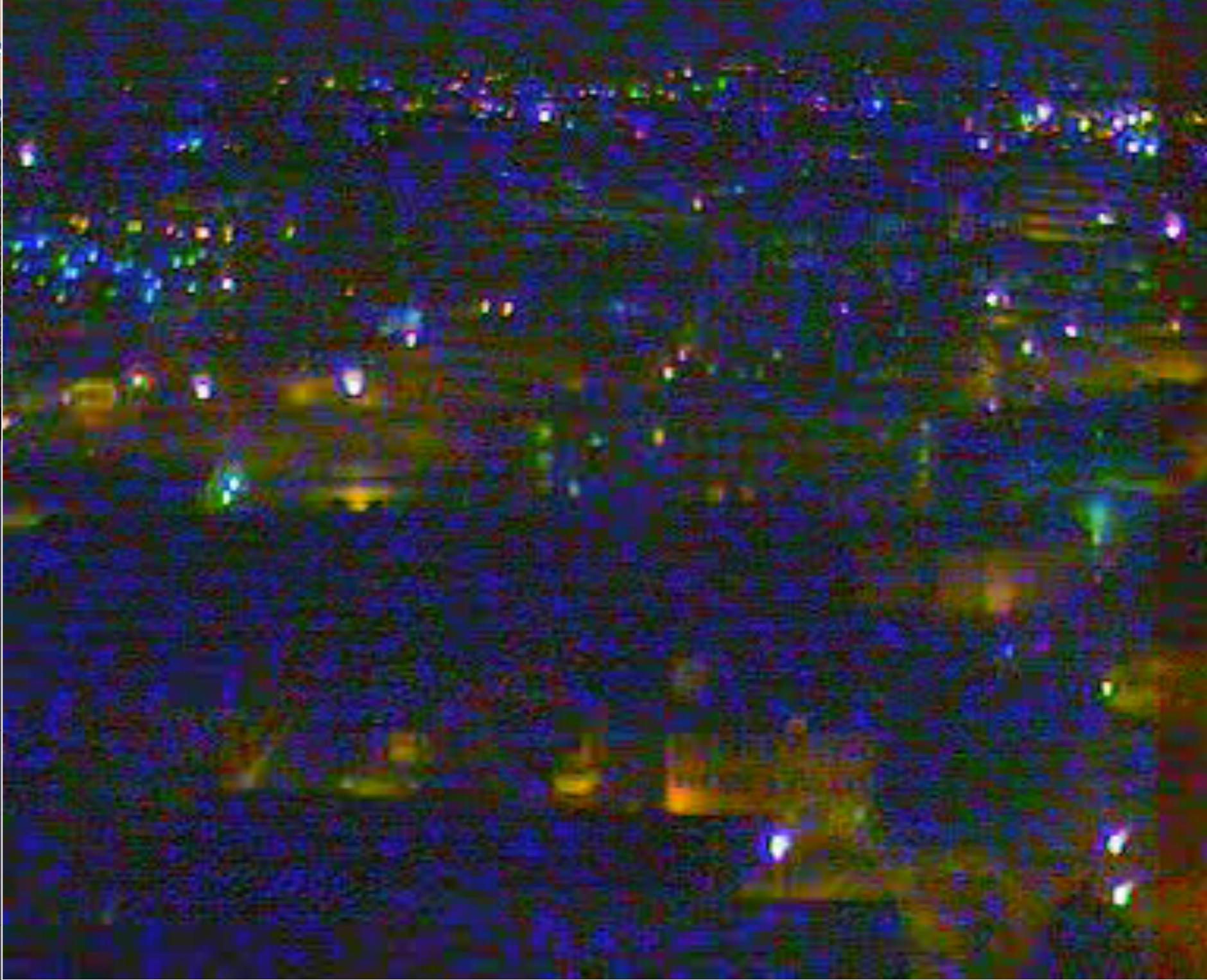
Two Joes: effect of 8 years on ID photo

- Joe Kovalik arrived in '86, did extremely tricky thermal noise interferometer measurement of glass plate butterfly mode.
- Joe Giaime washed up in '86 as a tech instructor, began grad school the next year. Thesis work on passive isolation stack and several length sensing & control techniques.

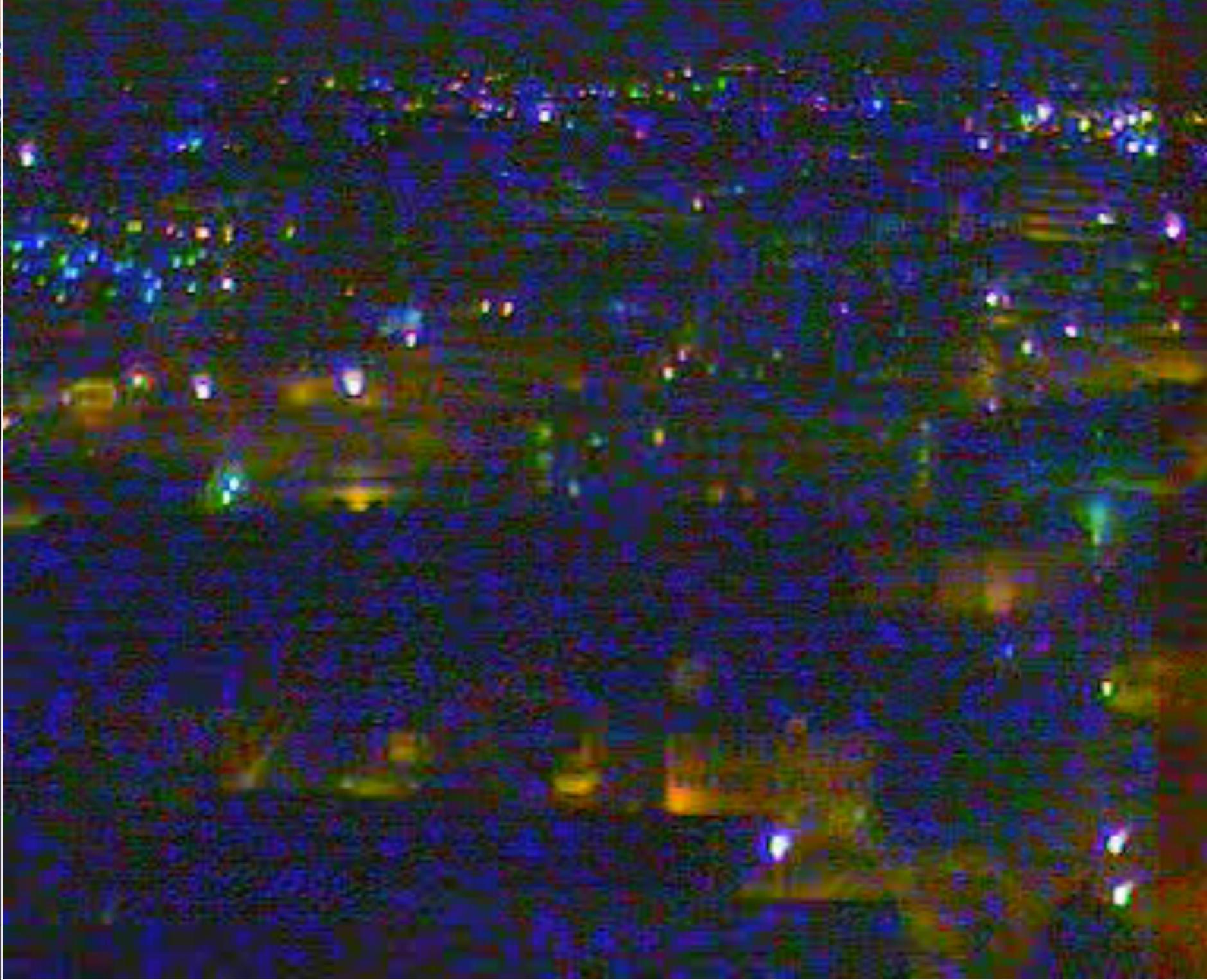


Two pioneers: Weiss and Hamilton in 2018





- Building 20 ... we miss ya.



- Building 20 ... we miss ya.