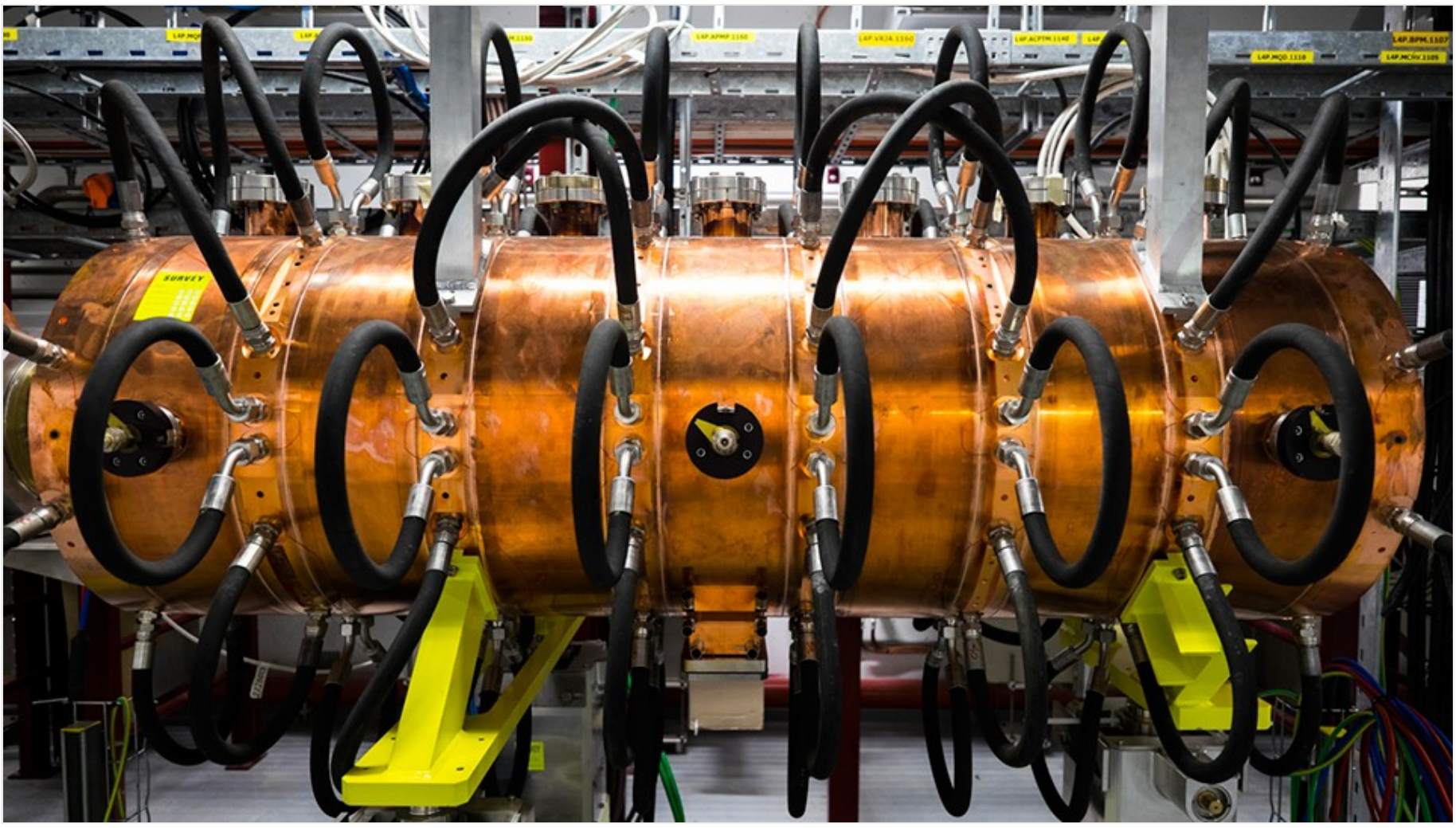
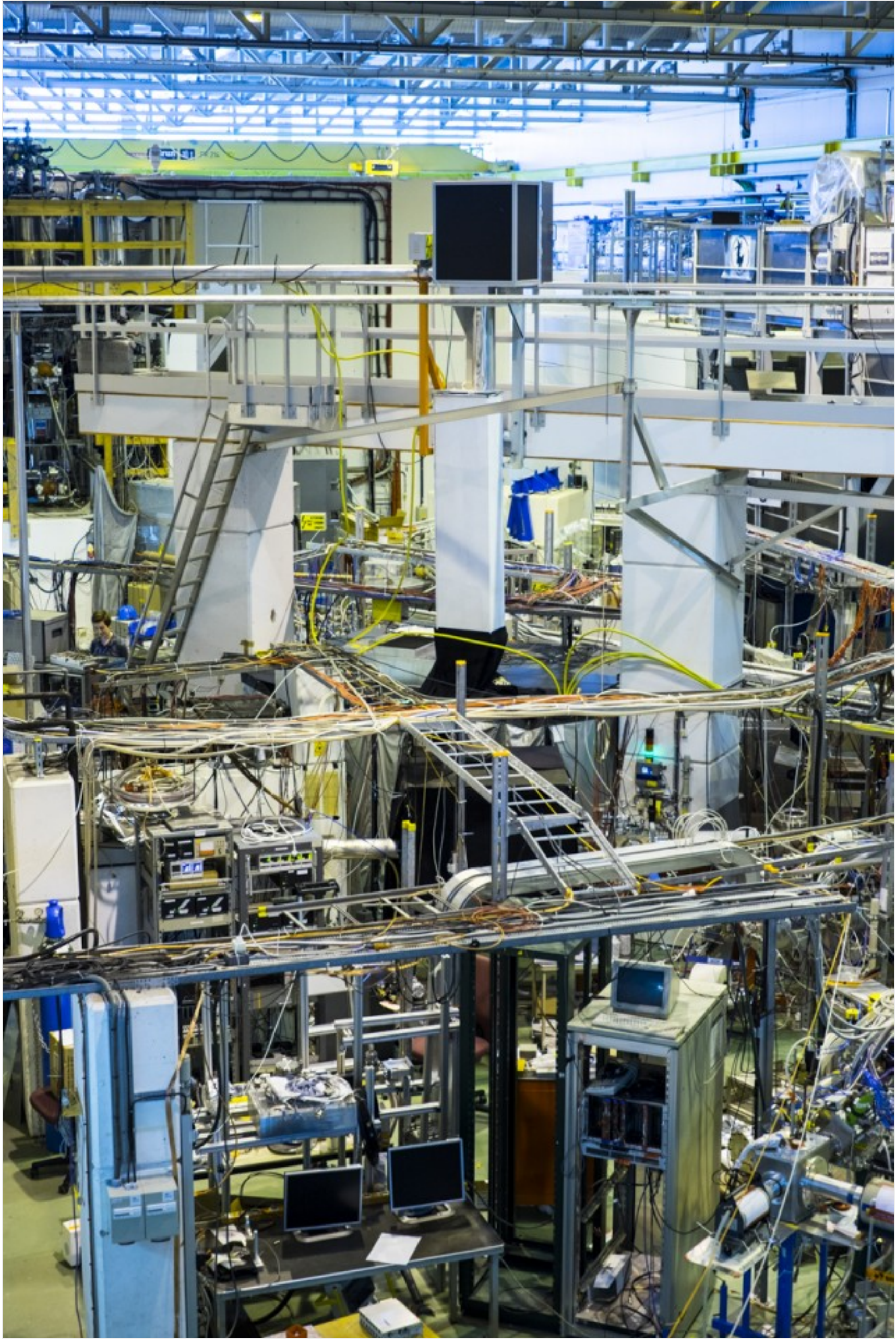
4 Photowalk Adventures at CERN, the European Organization for Nuclear Research



I fancy myself as an industrial photographer. I know, pretty fancy. In March of 2008, *National Geographic* ran an article, “The Search for All Matter,” about the search for the Higgs boson, popularly called the "God Particle," being conducted in the Large Hadron Collider (LHC) at the European Organization for Nuclear Research (CERN) in Switzerland and France. Accompanying the article, the cover shot was an image taken of the LHC's ATLAS particle detector in an underground lair, 300' below the countryside. My reaction to the photo, taken by CERN photographer Maximilian Brice, was: "I want to photograph that place." In fact, what I really wanted was the opportunity to take that very photograph. Yes, it would be a copy of Brice's photo, but I wanted my own.

But, how in the world would I ever get to photograph CERN? The idea seemed so remote that I did not even look into it. It is difficult to get permission to photograph industrial sites, even abandoned ones, so how would I gain access to the world's largest particle collider? When would I be in Switzerland? What if they asked to see my college transcripts and my horrid physics grades?

There is an almost-annual "Physics Photowalk" that allows photographers to photograph the world's premier physics research facilities, including the Fermi Lab outside of Chicago, the SLAC at Stanford University, and more. CERN last participated in the International Photowalk in 2010. This year, CERN decided to participate and the organization did a big push on social media outlets announcing a "contest" to win an invitation to photograph CERN.



The ISOLDE facility is over-packed with coolness.

The "application" was easy. Those interested were to fill out a short online form and then send out a tweet with a designated hashtag and a photo of: "What CERN means to you." My portfolio is lacking cool photos of particle accelerators and I drew a creative blank as to what to submit for the image. Also, I was at work and did not have access to my catalog of images, but I wanted to get my bid in as soon as I could, so I grabbed a photo of the moon from my phone—an iPhone photo that I digi-scoped through my Leica APO Televid 77 spotting scope several months ago—and fired it off via Twitter with the prescribed hashtags in place.

Todd Vorenkamp
@TRVphoto

Follow

I've just entered #PhysPics15 (cern.ch/photowalk2015) with this image of what @CERN means to me.

12:15 PM - 1 Sep 2015

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It's good to be confident in life, but I figured I had but a slim chance of getting picked, especially as the other submissions were looking really impressive. How would my handheld moon smartphone image stand up to the competition?

A few weeks later, my phone buzzed with an incoming email containing an invitation to the CERN

Photowalk! No way! Really? Me?

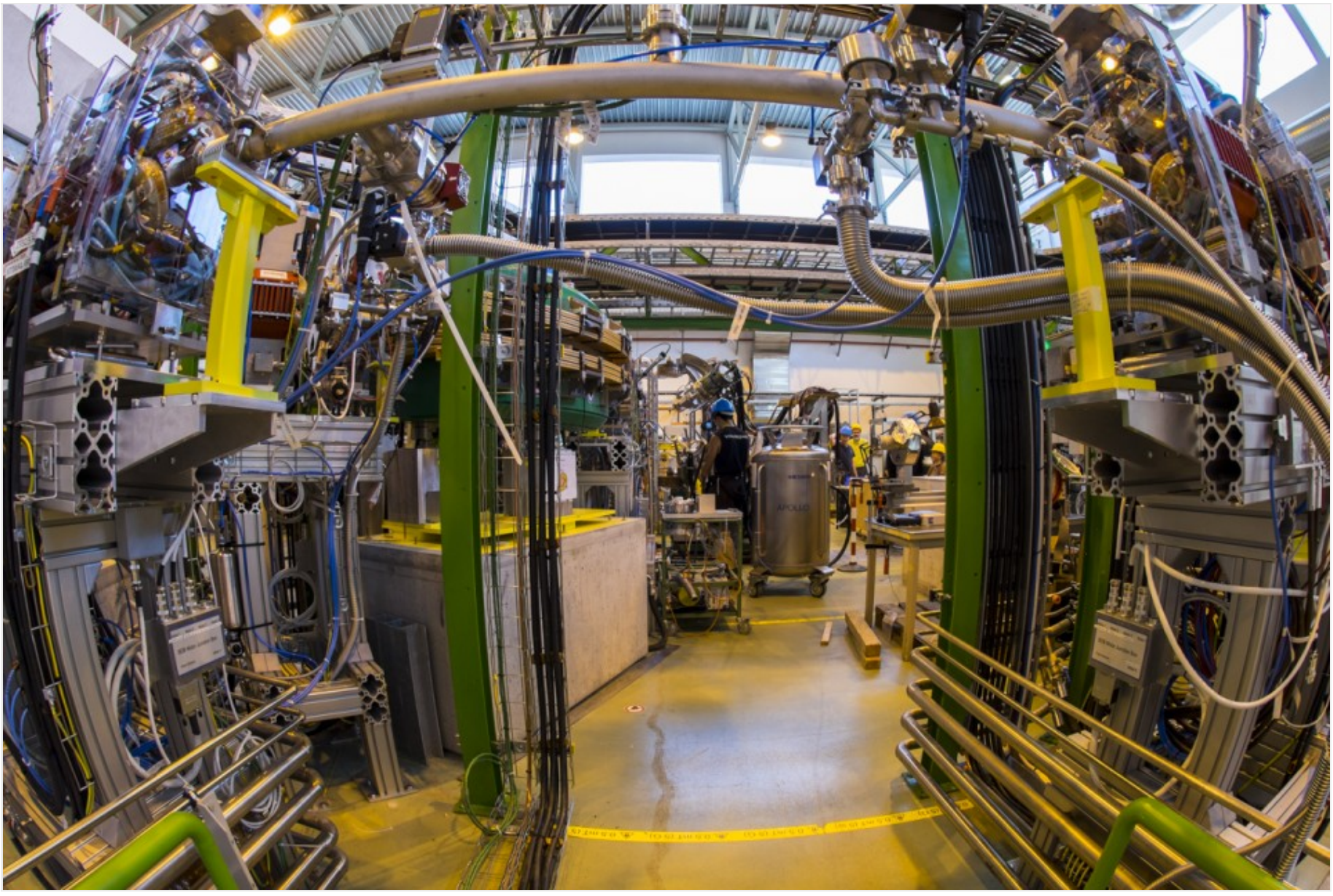
AWE-SOME!

Get ready, ATLAS, I am coming to photograph you!

A few hours later, I had plane tickets and hotel reservations and started planning what gear to bring.

Welcome Aboard

Arriving at CERN, the group of 19 photographers (one was a no-show) were brought to a conference room for an introductory briefing. CERN very much feels like a center of academia and on the walls of the conference room was a group of 25 portraits. The images were not of politicians, athletes, world leaders, corporate bosses, or paparazzi targets, but here were photographed more than two-dozen Nobel Laureates with props representing their experiments. It is humbling and enlightening to see these portraits, and it really gave me pause to think about where I was sitting and who these people were—people, not much different than you and I, who care about the world around us and are so curious about where we come from and what we are made of that they spend their entire lives searching for answers to questions that help explain everything we know and understand about the universe.



ISOLDE experiments

More than 21 member nations participate in CERN's experiments and research and between 8,000 and 10,000 people work on the CERN campus from 80 different countries. You are reading this article on the Internet. Did you know that the Internet was invented at CERN?

Many of my friends rib me about different "Nerd Alerts" but, all joking aside, the science done here and at other facilities around the world by people like these Nobel Prize winners is nothing short of amazing. The Nobel Foundation shines a light on these and other deserving supporters of science and humanity, but imagine how attractive science would be if these people received the attention and acclaim of pop culture tabloid stars?

The group received a briefing on CERN and then the staff divided the 19 photographers into four groups. We all had a strict schedule of four stops to make around the facility for photographs.

Site 1: Isolde Lab

The first stop on my group's itinerary was the ISOLDE (Isotope Separator On Line Device) Radioactive Ion Beam Facility. The first order of business was getting issued dosimeters to monitor our radiation exposure in the lab. Radiation isn't cool, but getting issued a dosimeter is! I wanted to keep mine as a souvenir.

The lab is host to several ongoing experiments and, as you walk in, if one of your life pleasures is photographing complex industrial sites, you feel like you have just reached Valhalla. Wires. Conduits. Pipes. Lights. Visible gas. The faint whiff of radiation in the air. This place is so cool!

Our physicist guide showed us around and the four of us (the no-show was supposed to be in our group) tried to pay attention to our tour while constantly raising cameras to our eyes, trying to capture the beautiful complexity of the place. "There are 3,500 known isotopes in the world. We think there are 4,000 more to be discovered," says the scientist.

I started in the control room, where four workers barely acknowledged my presence. The CERN population was given a heads-up that the paparazzi would be in town today, and no one seemed to mind my presence, nor were they scrambling to get in front of the camera.

Banks of computers hummed away in the control room, and on the back wall, through a short passageway, separate portraits of C-3PO and R2-D2 were taped to the wall.

Photos of management overseeing work in the ISOLDE control room

I started shooting from my tripod, but soon realized it was slowing me down and time was short. So I started imaging handheld, trying to control my breathing and steady my hands while my brain was in overload mode wanting photos of everything that surrounded me.

Our guide brought us to an experiment off to the side of some of the main machinery—named NICOLE. He pointed to a black cylinder suspended between two large machinery installations. Here, he said, was one of the coldest places in the universe—around 5 millkelvin—only a fraction of a degree warmer than absolute zero on the Kelvin scale. Amazing!

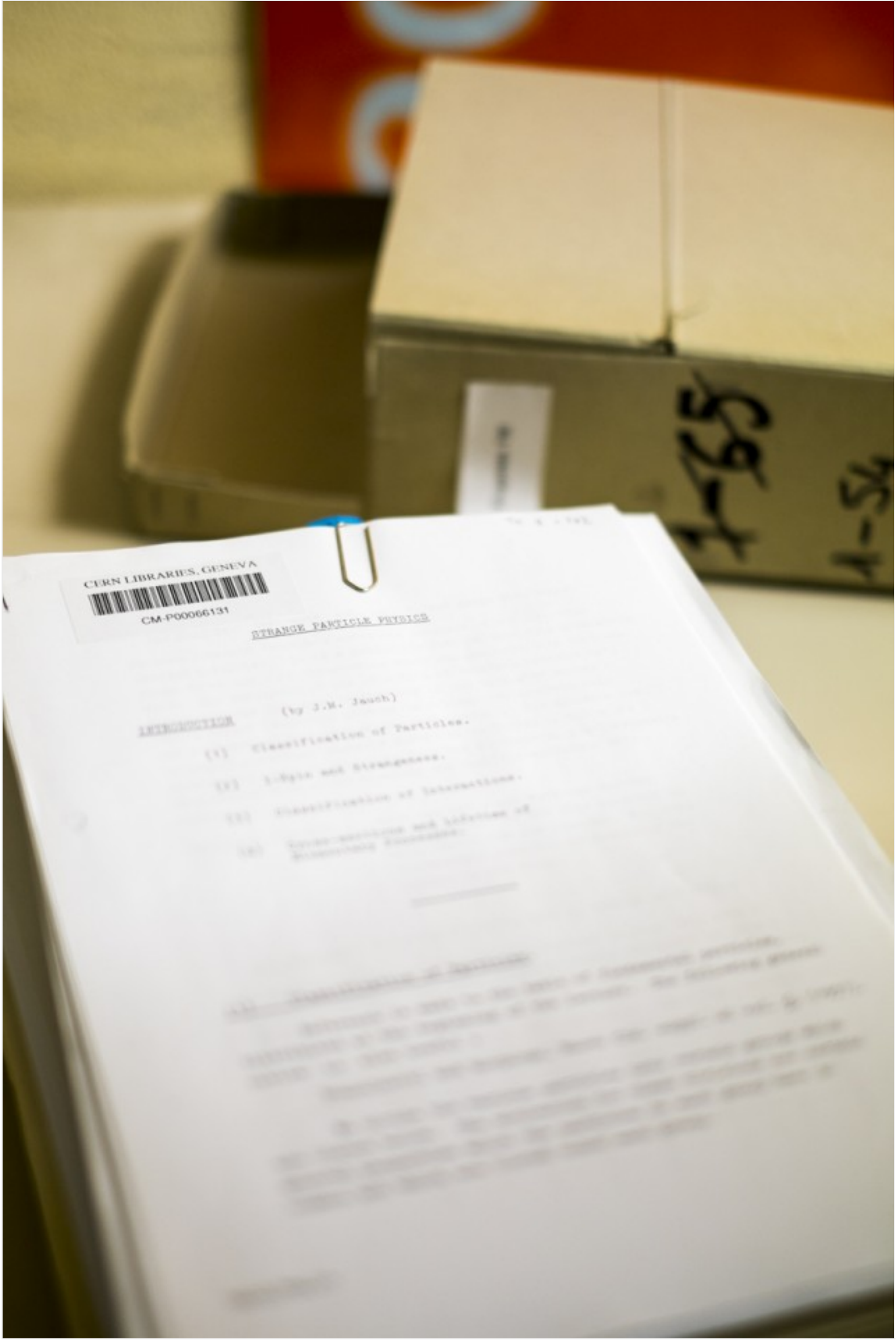
Before I could capture a fraction of what I wanted to, we had to leave after only 50 minutes. I returned my dosimeter (it registered zero), and we headed to our next stop. I could have photographed that lab for days without getting bored or running out of images. I wanted to go back.

Dosimeter reads "0" after 50 minutes in ISOLDE

Site 2: Campus

Our second photo mission was an exploration of the CERN campus. We were given treasure maps to guide us. Treasure wasn't specifically denoted—the whole place is treasure.

Our hunt would start in the archives. All the correspondence and research covering CERN's history is stored there. The archivist showing us around broke out a binder and opened it to reveal a paper written on a 1958 lecture titled "Strange Particle Physics." She also showed us photo albums from the early days of CERN. Again, I was getting rushed through someplace I could have spent days immersed inside, not just photographically, but intellectually.


CERN LIBRARIES, GENEVA
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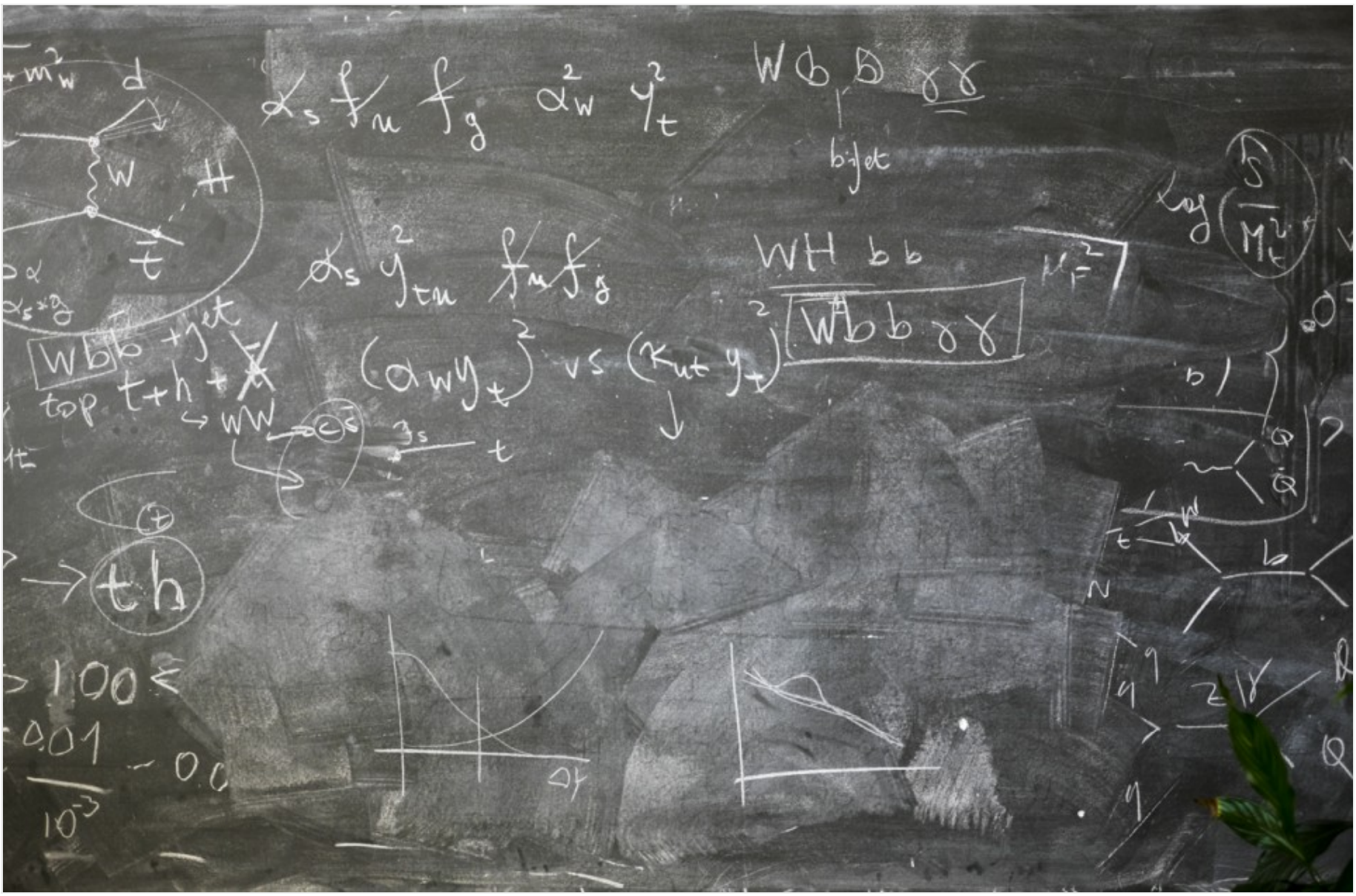
STRANGE PARTICLE PHYSICS

An early paper from the CERN archives

We were wise enough to ask our host where she would recommend going on the campus exploration. She quickly recommended, "The offices in building 400… check out John Ellis's office on the third floor." She added, "There is a ton of stacks of papers and he is usually in there with the door open."

The buildings around CERN are very European post-war modern in their architectural style. Some are more ornate than others, and some more modern, but you can tell the bulk of CERN was installed in the 1950s and 1960s. During the day, the buildings did not interest me much, but I would imagine that at night the artificial lighting might make CERN more photogenic to my eyes. Inside them, you get a sense of a cross between a college campus and quiet hospital.

Three of us walked into Building 400 and started looking for photos. We barged into an office where a physicist was hard at work but welcomed us warmly. The ISOLDE Lab is pretty cool, but when you find yourself standing in the office of a scientist and there are chalkboards on the wall with equations scribbled all over them—that is incredibly cool. You feel like you are standing on the precipice of the next great theory in the world of particle physics, but you aren't quite sure because you have no idea what the numbers and symbols mean.



No dry-erase here. Ideas and discoveries at CERN begin on the chalkboard.

We found Dr. John Ellis's office on the third floor, but he was not at his desk. What was on his desk was stacks of paper that would make a recycling center manager's eyes water. Paper everywhere; tall stacks leaning precariously and ready to spill their contents to gravity's whims. More chalkboards. More equations. The old saying is: A clean desk is a sign of a cluttered mind. Dr. Ellis's desk and office must belong to the least cluttered brain on the planet. I would wager a good sum of money that he knows exactly what is inside all of those stacks of papers.

A scientist at his desk at CERN

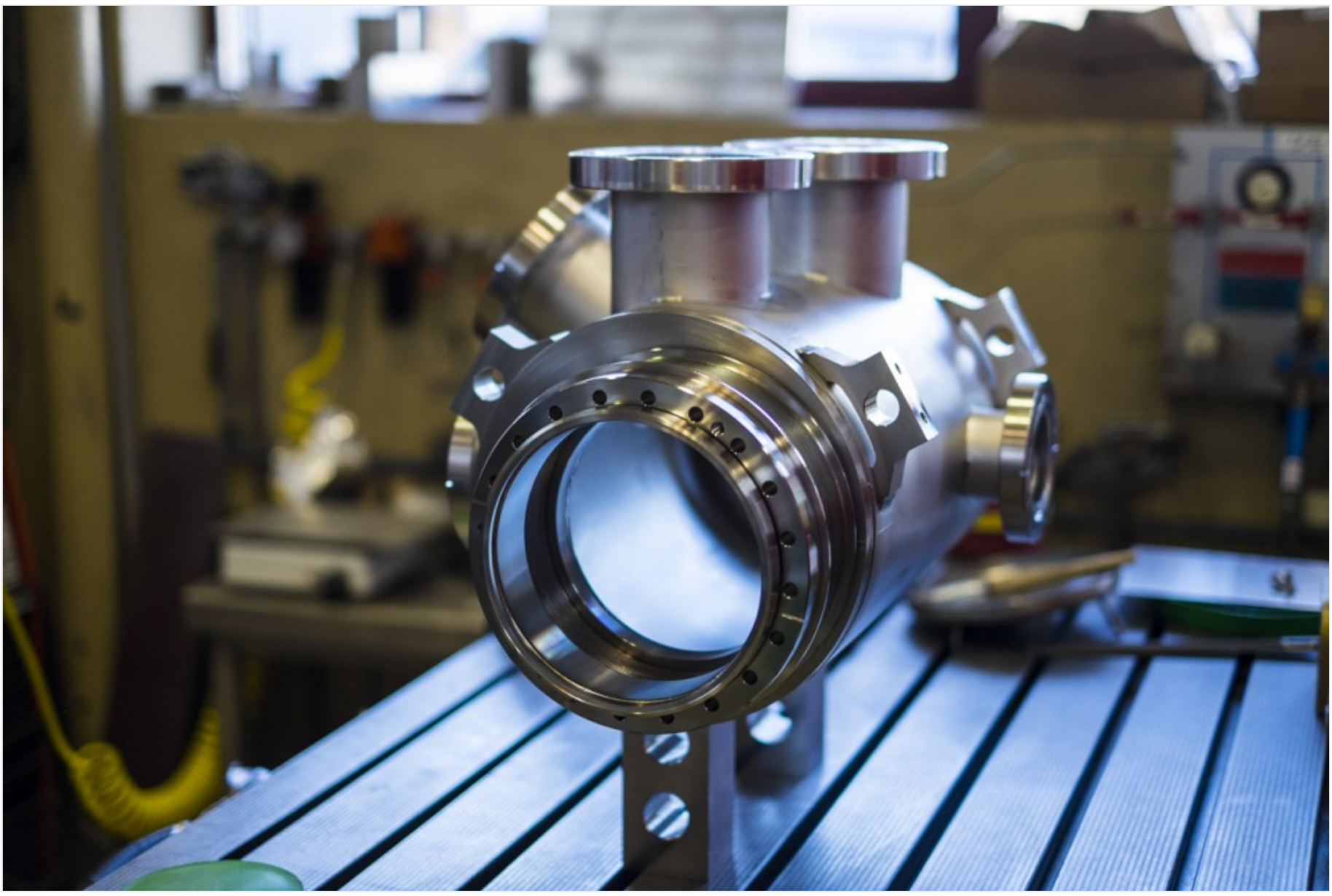
Dr. John Ellis' famous CERN office shows his impeccable organizational skills.

We headed back to our rendezvous point, but I stopped at the CERN auditorium. This is the very place where the existence of the Higgs boson was unveiled to the world after it had been discovered a few kilometers from this spot. Incredible.

Site 3: Machine Shop

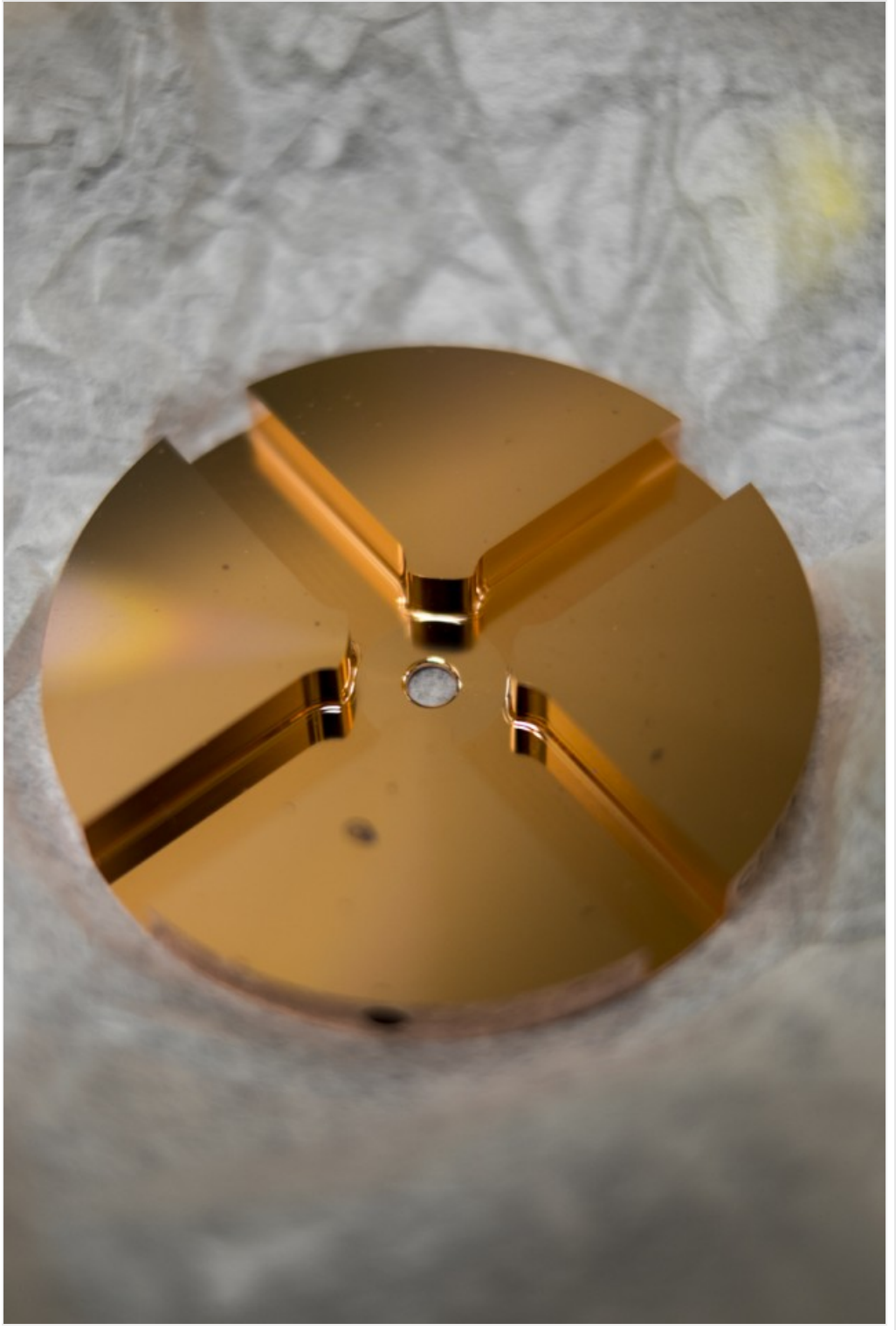
After lunch, our third destination was the machine shop. I haven't checked the B&H eCommerce site, but super colliders and particle accelerator parts are not available online. Someone has to make them and many of those folks work in the CERN machine shop. Arc welders, tools, drills, lathes, bigger lathes, and even bigger lathes fill the space where designs are turned into something real.

The building is another photographic treasure trove if your jam is industrial photography. Soak it all in. Compose, focus, release shutter. Repeat.



Beautiful handiwork from the CERN machine shop

Off to the side of the main machine shop is the place where they measure the stuff they make. When you are dealing with subatomic particles you need to measure stuff accurately. In one room the Zeiss Multi Application Sensor System (MASS) is doing 3D measurements of parts. In the next room, the Leitz Infinity measures with even higher accuracy.



Leitz Infinity machine measuring stuff	*Can you see the four scratches in the center of this piece? I can't, but the Leitz Infinity machine determined that the grooves were too deep.*

The Leitz machine, sporting the red dot familiar to scores of Leica photography fans, sits in a room where the air is kept at a precise temperature. Why? Because metal changes size when it warms and cools. I had to wear slippers over my shoes to enter the room that felt as close to "room temperature" as you can get. The $450,000 machine weighs 8.2 tons and has an arm that gently sends a stylus down to an object and determines the dimensions. The scientist who runs the machine explained how the Leitz device measures to 0.3 micron precision. "See this?" he asked in a heavy Swiss-German accent. "Do you see those four lines?" My eyes barely registered three very faint scratches on the interior of a milled copper piece. The lines were so slight that my eye never saw the fourth even though he told me where it was. The grooves on the back of a DVD are Grand Canyon-like compared to what I was straining to see. I nod. "They are too deep," he says, "This part is useless to us."

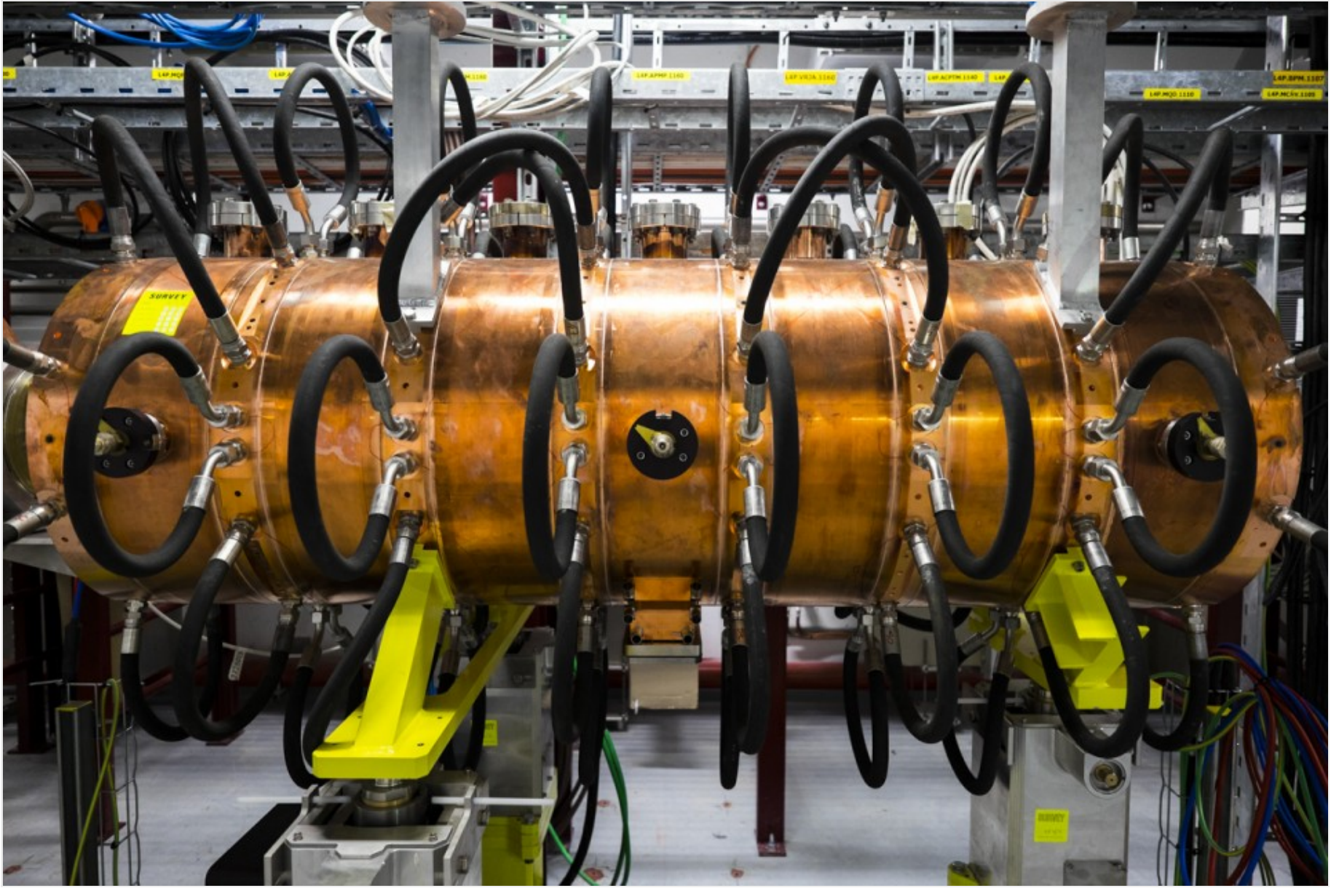
Whoa. I take some pictures of the Leitz machine with a precision-made camera and lens that suddenly feels a bit less precise when sharing a room with the Leitz.

A worker shows off some of his gear at the CERN machine shop.

Site 4: Linac 4

Our last official stop is Linear Accelerator 4 (LINAC 4), a new proton beam source that will join the Large Hadron Collider sometime in 2018. It is under construction and we are the first members of the photographic public that have been allowed to see this device. To gain access, our guide needs to have his retinas scanned. He then opens an adjacent door and we all go inside.

In the building, banks of computers work on the main floor. LINAC 4 is 40' below ground in the basement of its building. It is a 262' tube that stretches through a corridor. I ask how this will be moved to the LHC when it is finished. I am perplexed as to why you would build something so large underground and then move it. "It won’t be moved," says our guide, "It gets connected directly to the collider."



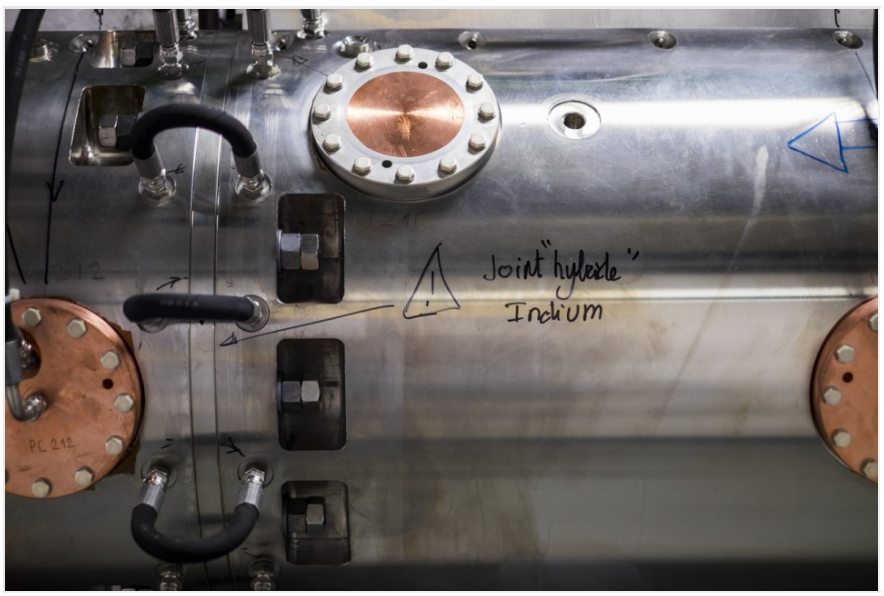
The LINAC 4 Particle Accelerator will plug into the LHC in a few years.

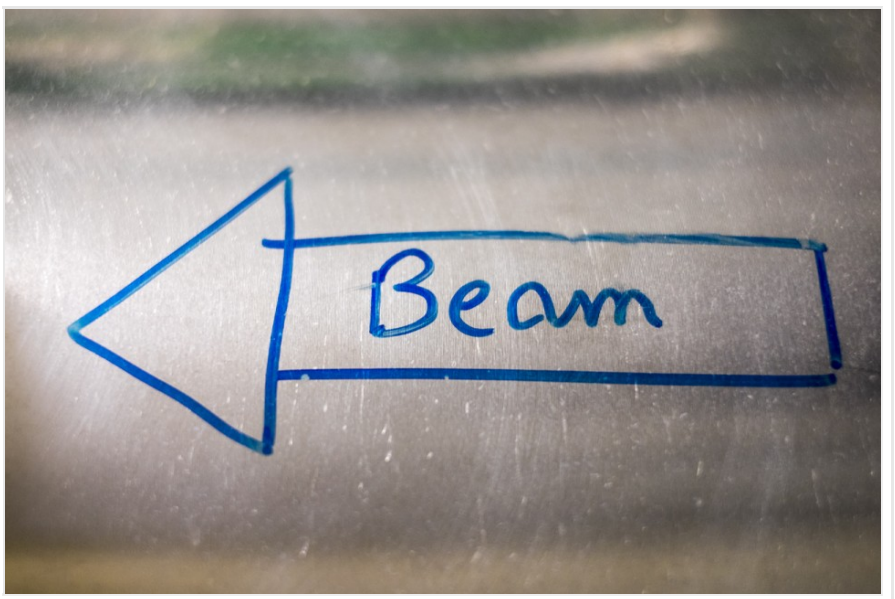
The $6.7 billion LHC, the world's largest machine, is a 16.8-mile, dual vacuum tube, subterranean ring that lives beneath the Franco-Swiss border. Different experiments either lay in line with the ring, or connect like spokes on a wheel. The aforementioned ATLAS is one of four particle detectors that are on the ring. At the LHC, hydrogen, the simplest atom (one proton and electron), gets stripped of its electron and then the protons are inserted into the collider where 9,600 magnets, super-cooled to -271.3^{0}C, accelerate the protons up to speeds approaching that of light. At this velocity, the protons cross the border between Switzerland and France 11,000 times per second. CERN calls the LHC the “fastest racetrack on the planet.”

Computers lined up in the LINAC 4 building

LINAC 4 will be a new spoke—more powerful and capable than the current LINAC 2. I don't ask what happened to LINAC 3 just in case it is a sore topic for the CERN staff.

Max Brice, the CERN photographer and nominee for the coolest photography job in the world award, joins our group and we talk about CERN and cameras and I ask our host to take our photo together. Later, I tell the staff that his photo of ATLAS is pretty much the reason I am standing in the LINAC 4 building.

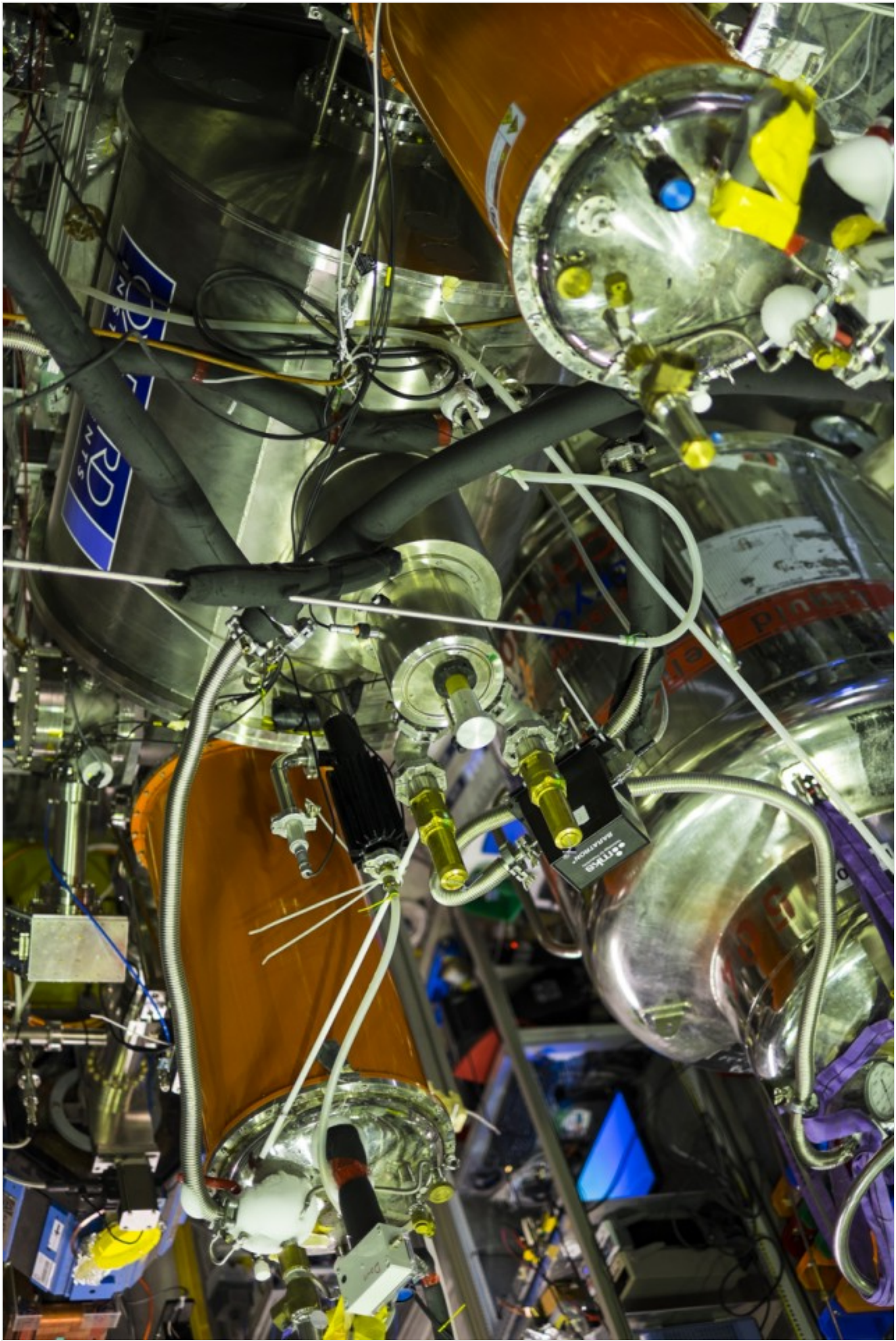




I loved the hand-written notes on the LINAC 4.	*The beam goes that way. Not the other way.*

Bonus: Antimatter Factory

Officially, the Photowalk is done, but a friend of a friend of a friend works at CERN and he has enthusiastically offered to allow me to photograph the experiment he is working on.



Experiments in the Antimatter Factory

We go to a building with a large sign on the facade that says, "Antimatter Factory." If warp drive ever happens, this is where you can send your thank-you notes. Inside, instead of speeding particles up toward light speed, the experiments slow particles down (more talk of nearing absolute zero Kelvin again), and their behavior is analyzed.

I am back in dosimeter territory and the ring of particles circulating the building is encased in what looks to be random sized, radiation absorbing, concrete blocks. Again, computers, wires, pipes, conduits, magnets, and super-cooled hydrogen tanks surround me. Do I have to go home?

Radiation-blocking concrete surrounds the particle ring at the Antimatter Factory.

End Note

If there was one thing I wish I had more of at CERN, it was time. Unfortunately, I failed to find a time machine on the campus with which I could have slowed time. I am sure they have them there.

I spent 16 months photographing an abandoned mill for my thesis. In many ways, that mill paled in comparison to the photos that can be found at CERN—perhaps the most amazing industrial site one can photograph. And, at CERN, I had less than four hours for pictures.

I noticed that everyone at CERN with whom we came into contact seemed to be enjoying his or her work. Everyone was welcoming to a random group of stranger photographers and, because of this, I left CERN with the distinct impression that the folks who work there are happy because they are passionate about their work. They know they are doing important work, and they share a curiosity about the universe that seems to breed positive energy.

The supermoon rises over CERN and the Swiss Alps after the Photowalk.

As far as my dream photo of ATLAS: no go. Max Brice photographed it before it was assembled, so that photographs will never exist unless the detector is disassembled sometime in the distant future. Also, the day we were at CERN, the LHC was operational and flinging protons around the rings, so we were not allowed to photograph the machine. Oh well.

I very much enjoyed the experience of being able to photograph CERN. Even with the time restrictions curbing my ability to create engaging photographs, it was an incredible privilege to be able to

photograph the facility.

Even without a camera, the experience would have been unforgettable to me. I would encourage everyone interested in CERN and other physics labs to read articles and watch programs about the unbelievable experiments being conducted by the dedicated scientists and engineers of these places. And, better yet, do not hesitate to apply for the next Physics Photowalk at CERN or at other facilities around the world.