PHYSICISTS ROCK!

WHEREVER PHYSICS GOES, MUSIC FOLLOWS, FROM THE LYRICAL STRAINS OF FLUTE AND VIOLIN TO BLUE WINE, LES HORRIBLES CERNETTES AND DRUG SNIFFING DOGS. BY TONA KUNZ

Standing on a stage near the border of France and Switzerland, the songwriter and keyboard player for Les Horribles Cernettes looks up at the sky and grimaces. So much for the annual free Hardronic Music Festival, he thinks. Thousands of physicists, engineers, technicians, and their families sit in a grassy field, far from any shelter, at CERN, the European particle physics center. The crowd got in free; they won't hesitate to leave, Silvano de Gennaro thinks. He sighs, and his fingers touch the first note of the song "Big Bang" just as buckets of rain start to fall.

People start moving—but not to go home. Concertgoers pick up plastic chairs to shield their heads. Others alternate clapping to the beat and wiping rain out of their eyes.

Then water shorts out the lighting system. A bevy of upcoming special effects—heart-shaped balloons, bubbles, disco lights, smoke—vanish into the darkness. Disappointed, de Gennaro gets ready to pack up.

A beam of light streaks across the stage, focuses on a musician and stops, followed by another, and another. People are pointing flashlights retrieved from their cars.

"They were singing along. They called us back three times," recalls de Gennaro, who heads the laboratory's multi-media production department. "They were all drenched, and they stayed anyway."

Their set finished, de Gennaro and his wife, Michele, change from the 1950s-style attire of the Les Horribles Cernettes, who sing doo-wop songs with physics themes, into the black and leather of a heavy-metal band.

Backed by a grinding guitar and pounding drum beat, a seductive Michele closes out the festival, whose 10-band lineup had the audience swaying to jazz, lindy-hopping to the Cernettes and, at the end, flailing wildly.

"They jumped on the stage with us and sang along," de Gennaro says. "They head-banged."

With two decades of history behind it, the Hardronic Festival may be the biggest and best-known event in the high-energy physics music scene, but it's no anomaly.

Wherever physics is done, music rears its head—from a 20-year-old revolving-door rock band in Illinois to the sound of bamboo flutes in Japan, a jazz band in Germany, and a college physics instructor from California who spreads a message of science activism through a provocative night-club act.

The Canettes
From left to right: Jim Stone, Connie Potter, Wojt Krajewski, Wolfgang von Rüden, Simon Baird, David Boys, Marc Dambrine, and (top right) Steve Goldfarb.
Photo: Claudia Marcelloni

CERN's Les Horribles Cernettes
The Cernettes are known not just for their physics-flavored doo-wop, but also for posting the first photo on the Web. They also claim the first home page for a musical group. From left: Anne MacNabb, Michele de Gennaro, and Vicky Corlass. *Photo courtesy of Les Horribles Cernettes*

Beautiful connections

"I kept telling people it's not that different liking science or music," says Tokio Ohska, a former professional classical singer and semi-professional opera singer who is now a physicist at Japan's KEK laboratory. "In science you appreciate the beauty of the structure of nature. In music it is the same. You appreciate the beauty of the structure."

Music, he says, "kind of trains your mind so you can be creative. If you like physics and nothing but physics, I don't know if you can be creative."

Music and physics go back a long way. The Greeks used musical constructions to explain the orbits of planets. Albert Einstein played the violin. Werner Heisenberg played piano. Richard Feynman played bongos. Even today, college courses and popular science books such as Brian Greene's *The Elegant Universe* use musical analogies to explain string theory.

"It is amazing how much music has inspired physics," said George Gibson, a physics professor at the University of Connecticut who teaches a course on the physics of music. "It's kind of a one-way connection. Physicists are interested in music, but musicians aren't necessarily interested in physics"—although he says his course has persuaded some students to switch to physics majors.

Both music and science require self-discipline and the ability to work toward a distant goal, often by yourself. Like the math underlying physics, music consists of symbols making up a non-verbal language that uses patterns to forge meaning.

"We find order with a few gaps intriguing," Gibson says. "A gap in the Standard Model makes you want to find out what it is. Gaps in music draw you in because the pattern is not resolved until the song plays out. I assume an interest in music or physics is just playing on the same process in the brain."

Others take a less cerebral view of the connection, suggesting it is a byproduct of the long work hours and frequent travel that careers in physics often entail. People seek out music as a way to relax or to connect with researchers from other countries.

"It's really magic," de Gennaro says. "You all work together, and then you see your colleagues jumping around on the stage."

Dogs rock the prairie

Fermi National Accelerator Laboratory sits in the midst of an Illinois prairie that has been restored to its pre-settlement, early 1800s condition. The users' center and bar feel almost as old. Hand-me-down couches abandoned by graduate students push up against faded, wood-paneled walls. When the center fills with students and collaborators from the Collider Detector experiment at Fermilab, or CDF, it has the cozy feel of a family reunion at a small-town lodge. The feeling is heightened by the fact that the collaboration has its own rock band, Drug Sniffing Dogs.

"It is definitely fun to do something with your colleagues in a non-work context," says saxophone player Andy Hocker. "It is kind of a natural way to keep the camaraderie going."

The band's name was the result of a stalemate: after failing to find something everyone liked, members agreed that the name would be based on the next television image they saw. It was a show about police dogs.

The group plays for collaboration meetings, members' weddings, and block parties, and occasionally at the users' center for the whole lab. Dancing always ensues.

"A lot of people bring their children, so there are usually a half-dozen 2- to 5-year-olds swinging their arms in front of us," says Ben Kilminster, lead singer for the Dogs.

"We feed off the energy in the crowd."

In a world where jobs depend on yearly grants and researchers fly around the globe to work in international collaborations, holding a band of physicists together takes work. Band members rotate in and out. Founder Steve Hahn, the only constant, finds new members and offers his home for practices.

To ensure that enough players are available for each gig, the band has to build in redundancy. The Drug Sniffing Dogs roster includes five lead guitarists, two bass guitarists, two saxophonists, and a couple of horn players who can play several instruments.

In its 20 years of existence, the band has experimented with musical styles to see what would get people on their feet. Feel-good, ageless rock classics work best. Cover tunes with physics lyrics drew interest, but not as much dancing, so they've been dropped from the repertoire.

At one lab Halloween concert, a saxophonist jerked his head at his band mates when he saw most of the crowd on its feet rocking to the song "Knock on Wood."

"So we started running around in the crowd," Hocker says. "Someone grabbed one of the horn players and that just sort of spontaneously morphed into a conga line."

Building a music scene

Each laboratory has a unique musical culture, a blend of local styles, on-site amenities, and staff tastes.

At KEK, for instance, Ohska tried to get a band together, but people were too busy. So he created a concert series that brings in outside musicians,

Fermilab's Drug Sniffing Dogs
One of many incarnations of a band that has been evolving for 20 years. From left: (front) Louise Oakes, trombone, euphonium; Jared Yamaoka, drums; Ben Kilminster, vocals; Steve Hahn, guitar, keyboards; (back) Antonio Boveia, guitar; Andy Hocker, saxophone; Ulrich Husemann, saxophone; and Aron Soha, bass.
Photos: Fred Ullrich, Fermilab

as well as an annual art festival that mostly features solo or duet performances by lab personnel. There, the music takes on a soft and lyrical quality as crowds gather to hear co-workers on bamboo flutes and violins.

CERN has more success building bands. The lab has a practice room and a music club with 120 members. But it took nearly 30 years to grow such a substantial musical base. For the first Hardronic Festival in 1989, de Gennaro could barely scrounge up a dozen musicians to forge last-minute acts to fill the stage. Today the festival has more would-be participants than it can accommodate, and the lab hosts smaller concerts every two or three months.

"The Hardronic Festival was really the spark that started the fire," de Gennaro says. "There was a massive number of people who came around and joined the music club after that."

By providing mixing boards, microphones, and other equipment for a small fee, the music club has encouraged the creation of bands like the Canettes, whose name is both a play on Cernettes and a nod to the half-liter beer orders popular in Geneva.

"I said, 'OK. Let's try this out,' and it was fun," says Steve Goldfarb, who along with fellow ATLAS experiment member Connie Potter is a lead singer for the blues band. Three more CERN employees and four local residents complete the roster.

Although vacation schedules make it hard for the blues band to play the Hardronic Festival, it appears regularly at local clubs, drawing a fan base of several hundred Americans and Britons. Some members wear black suits, sunglasses, and hats reminiscent of the American movie classic *The Blues Brothers.*

During a recent gig at the 7 Arts pub, harmonicas and saxophones moaned as Goldfarb jumped around and fell to his knees, crooning to the standing-room-only crowd. "Some real blues, man!" yelled a Florida man, Paul Vega, from the audience. "Finally, some blues in Geneva."

DESY's Blue Wine
Below: Manfred Rüter, trumpet. Bottom: Yorck Holler, front, records the session; at back (from left) are Felix Beckmann, trombone; Peter Gasiorek, drums; Jan Kuhlmann, bass; Bernd Reime, guitar; Hans-Bernhard Peters, saxophone. Top right: Christian Mrotzek, saxophone. *Photos courtesy of DESY*

Blue jazz

At Germany's Deutsches Elektronen-Synchrotron Laboratory, or DESY, the music scene grew more slowly. The lab now has a choir, a classical band, and an orchestra. Individual staffers practice banjos, pianos and trumpets for solo shows. Rock bands are rare, but a jazz band with a soulful side has found a niche.

Blue Wine took its name from the bottles consumed during practice to loosen lips and fingers, and—depending on which band member you ask—the German term for "drunk" or a term for blues-inflected scales and notes. The 10-member band plays occasional gigs before a crowd of about 150 in a nearby small town. It also performs three or four times a year at the lab's restaurant, for holiday parties and at employee birthday parties.

Core band members come from the technical, computer, administrative, and research sections of the lab. One non-lab musician rounds out the group, which ranges in age from 32 to 67, and visiting researchers sit in. "The band is very open," says trumpet player Manfred Rüter.

As at other labs, weekly practices must compete with work and family commitments. "Sometimes we have more bottles of red wine than musicians," says saxophone player Christian Mrotzek. That's OK, he says, because the night is as much about socializing and relaxing as making music.

Rüter, who initiated the group, took to music much later than his band mates did. As a young man he was captivated by the free-spirited, high-energy vibe of jazz clubs and wanted to take up the trumpet. He just never found the time until a DESY colleague walked into his office talking about music. Rüter was 50 at the time. He shared his desire to play, the colleague said he had extra trumpets at home, and for the next nine years Rüter practiced and played off and on with friends before launching Blue Wine with fellow lab employees. The band has been together five years.

Mrotzek, meanwhile, had been playing saxophone. He didn't want to bother anyone, so he practiced his instrument in a guest room below the lab's cantina. That's where guitar player Bernd Reime found him. As Mrotzek recalls it, Reime asked, "What are you doing here? There is a band nearby. You have to come play."

Later, Reime saw Felix Beckmann walking through the lab with a trombone case. The men started bumping into each other and into other music lovers and talking about songs. Blue Wine was solidifying.

Drummer Peter Gasiorek had retired, but came back at age 67 to join the band because it gave him a connection to the lab and his old colleagues.

Judging from audience reactions at DESY and other labs, they seem to enjoy those connections, too.

Physics cabaret

Some bands use music to enrich their lives; others use it as a way to show non-scientists their world.

The Cernettes sing about physics concepts in songs like "Every Proton of You" or "Big Bang." They also sang "Surfing on the Web" in 1992, at a time when the World Wide Web, created at CERN to allow physicists to share data, was a mystery to most people. The first photo on the Web was of the Cernettes, who also claim to have created the first homepage for a musical act.

Physics Chanteuse
Lynda Williams, whose day job is teaching physics and astronomy, adds a cabaret feel and political bent to her music as the Physics Chanteuse.
Photo courtesy of Lynda Williams

Lynda Williams also sings about physics, but with a political message. As the Physics Chanteuse, she croons about the 1980s political downfall of the Superconducting Super Collider, which was abandoned midway through construction in Texas. In "Hi Tech Girl," set to the tune of Madonna's "Material Girl," her backdrop is a photo montage of 300 women scientists.

Women have not always found her act endearing, though. She dresses in evening gowns or slinky cocktail dresses with go-go boots, turning her act into a cabaret. Some say the sex appeal in the show demeans the science, but Williams, who teaches physics and astronomy at Santa Rosa Junior College and formerly at San Francisco State University, says it does just the opposite.

"I can prove science is super-sexy," she says. "I don't mean pornographic; I mean titillating. It's cool. It's slick. String theory and high-energy particle physics are as cutting edge as there is. People are really, really interested in smart, sassy, sexy science and that is what I do."

The American Institute of Physics commissioned her to write a song for Valentine's Day. The result was "Love Boson," about an unmeasurable particle that mediates the force of love. Physicists cheer the show, she says, but it's the engineers, political junkies, and science fans who really go wild. And winning over those groups helps scientists make the case for cutting-edge research projects to the general public.

She says she hopes her songs encourage people to spread the message that understanding science is power.

"If I am going to talk about global warming or carbon dating, before I can make a political comment people have to understand the science," Williams says. "They are always surprised. They say, 'I had no idea this is what science is about.'"