Lichtpreis für kein Licht

„Lux.us“ wurde gestern Abend Tim Otto Roth verlieren. Künstler möchte – zur Freude der Stadtwerke – das Licht löschen

The Amygdaloids performed tunes from their new album, *Brainstorm*, some of which explore how love can disrupt normal thought processing. In *Crime of Passion*, a jealous lover’s rage momentarily overwhelms his rational thinking: “Sentenced to death for a crime I did commit/I couldn’t stop/I did it in a fit of anger and pain.”

Cognitive psychologist, vocalist and guitarist Daniel Levitin of McGill University in Montreal, Canada, sang a scientific homage to the 1989 hit *Wicked Game* in which Chris Isaak croons “No, I don’t want to fall in love.” Levitin’s version, *I Don’t Want My Brain Cut In Two*, refers to a drastic procedure once used to treat epilepsy.

Levitin says his experiences in the recording industry now inform his work in the lab. “I was always astonished by how long it takes to make a three-minute song, and how many times you have to record to get it right.” He explains that he has to be similarly patient when repeating experiments or redrafting a research paper.

Other scientist performers included neuroscientist and classical guitarist David Sulzer, known on stage as Dave Soldier, and geneticist Pardis Sabeti, of Boston-based band Thousand Days. Among the professional musicians was guitarist Lenny Kaye, who has recorded with punk singer Patti Smith, and Twisted Sister’s Dee Snider.

Wainwright held nothing back in his set. He professed he “failed every science course [he] ever took”, but supported the charity gig because “scientists have become the new oppressed people, and I’m always there for the oppressed.”

Roxanne Khamsi is news editor at Nature Medicine in New York.

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#### Flashes of cosmic brilliance

Tim Otto Roth’s minimalist art installation reflects the complexity of cosmic radiation, explains Martin Kemp.

Daylight is fading over a grass-covered field. Looking like extra-large bee hives, 252 white cabins on short stilts are regularly distributed across its vast expanse of 44,000 square metres. A larger ‘house’ occupies the space of the central 4 units. At the centre of each square block of 16 cabins is set a two-tier, highly reflective, cylindrical device.

As darkness envelops the array, short-lived flashes of light erupt unpredictably from the 16 devices. Sometimes one launches alone. At other times they evoke straight lines, or neat clusters. Or just flicker here and there. The flashes are so rapid and apparently random that our eyes search in vain for a repeated pattern. Logic appears to be defied. What are we witnessing? A high-tech scientific experiment? Some sci-fi setting for a war of the worlds? An evocation of a night-time bombing raid?

We are, in fact, watching a minimalist-style art installation by German artist Tim Otto Roth. His *Cosmic Revelation* (see http://tinyurl.com/cosrev) presents a sensory experience of the cosmic radiation detected by the KASCADE project at the Centre for Elementary Particle and Astroparticle Physics at the Karlsruhe Institute of Technology, Germany. Roth’s installation is both an artwork and an act of science communication. And it interacts in an unexpected and compelling way with the systematic recording of cosmic phenomena.

The cabins contain detectors for the elementary particles that move at speeds close to that of light and crash incessantly into our atmosphere. These multiple collisions initiate cascades of millions of new particles, and KASCADE measures those that have energies of around $10^{14}$–$10^{17}$ electronvolts (eV; one eV is equivalent to the energy acquired by an electron falling through a difference in potential of one volt). Together with other detector units distributed across the research centre, the KASCADE-Grande experiment can detect energies as high as $10^{18}$ eV. The results are recorded in a central laboratory by neat grids of LEDs. KASCADE’s scientists can view the topographical display of data received by all 252 cabins live on the Internet.

Roth’s 16 strobe-light units are in themselves pieces of high-tech sculpture that come into their own as beautiful objects during daylight hours. A 1,500-watt linear flash tube in each unit is protected from the weather by the upper disc. A convex mirror is set into the lower disc so as to project the pulses of light radially from the cylinder’s open sides.

These ‘cosmic mirrors’ carry the visual outputs of the laboratory apparatus back into the field of the outdoor detectors, transforming the energies of the unseen into wavelengths accessible to human sight. Thus transformed, the particles’ energies are transmitted back into the space through which they have cascaded.

When Roth categorizes his work as minimalist, he is referring to the reductive mode in art and music that arose in the late 1960s. It relies on the stripping down of a composition into basic units, often regularly repeated and frequently mathematical in form. From the repetition and regularity, paradoxical variousness and complexity emerge when the viewer moves or the lighting changes. Reflective surfaces are particularly favoured.

The generation of complexity from simplicity parallels those physical phenomena that fall under the embrace of chaos theory, and mirrors the reverse processes of measurement, as when the unpredictable complexity of the particle showers are first trapped in the grids of detectors and then registered in the LED arrays in the lab. The chaos of the flashes in Roth’s apparatus is placed in a subtle dialogue with both the phenomenon itself and the manner of its recording.

The ancient followers of Pythagoras characterized the harmonics of cosmic energy as the “music of the spheres”. The mathematical foundations lay in the proportional system of the musical scale and in the perfections of Euclidean geometry. Here, by contrast, we stand as witnesses to the chaotic drumbeats of cosmic radiation. The new music is that of quantum mechanics and complexity — probabilistic rather than deterministic. A new art is encoding a new science.

Martin Kemp is emeritus professor in history of art at the University of Oxford, Oxford, UK.

See also page 847 and www.nature.com/astro09.
OBSERVATION: young stars lie inside a thin filament, visualized with a computer overlay. The hot stars make the hydrogen glow. Other objects in the image are nearer galaxies or stars.

Left side: Supercomputer Simulations Explain the Formation of Galaxies and Quasars in the Universe. The Virgo consortium, an international group of astrophysicists from Germany, the UK, Canada and the USA has released first results from the largest simulation ever of cosmic structure growth and of galaxy and quasar formation.

courtesy of the images Dr. Volker Springel
IMAGES FROM: http://www.mpa-garching.mpg.de/galform/press/

TS: There are astrophysics who compare the structure of the origin of the universe with the structure of a spider web. Here I like to show you some pictures of the best visualization of that origin, the Millennium Simulation.

PJ: Ah, I see. But this here is very untypical for spiders because spiders have only one line or thread, nothing else. Of course they can make three or two-dimensional webs, but this is another type of action. Do you know what I mean? The results seem to be similar but the action or the process is something different. If a spider works here, then there, followed by a return to the first spot and …

TS: … and starts again somewhere else afterwards…

PJ: Yes, and this is as if the spinnerets were multiplying every time and so one has billions upon trillions of spinnerets of doing this. The functional object of creating these lines is multiplying this way and of course you have one starting point. One could say, though it doesn’t make sense, that it’s a mother of a spider with her offspring and every knot is offspring born and they make their webs. But of course it’s not, then it would be like a life thread, a century.

TS: But if you keep zooming in on this, then they seem to look like galaxies. And in the end we’re making such a layer.

Conversation with Peter Jaeger.

PJ: If you would like to have a more three-dimensional method for your spider experiment than you can put the spider in a tube, probably not the cage, and then place the tube in a different environment, which you built - it would make threads. If it were not two but rather three-dimensional then it would make a web. It’s a little artificial but so what. If you have a rock surface, which is not always three-dimensional, then naturally it would adapt.

TS: We mentioned already last time that if we change the position of the house, putting it upside down together with the spider to this position or in that position, the spider would not lose its orientation?

PJ: It will modify the web according to the current state of gravitation. I think she will only add threads. For example I have a black widow in a small tube and initially I had it in a tray. I would say - something usually in the nature - probably if the vegetation is involved then it could be turned.

A: There is an upside and downside direction in each web, isn’t it?

PJ: It has to be, because otherwise the black widow is always making these sticky lines only in one direction. But I’m not sure whether they look for an orientation or towards the structure of the web.
Cosmic Spectrum at redshift 0.06

![Cosmic Spectrum](image)

- **Relative Flux / $F_\nu$**: The y-axis represents the relative flux or intensity relative to the peak flux.
- **Wavelength / Angstroms**: The x-axis represents the wavelength in Angstroms, with values ranging from 3500 to 7000 Angstroms.