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The collage consists of 25 individual images arranged in a grid-like fashion, showcasing the diverse research and educational activities at the Institute of Archaeology and Ethnography. The images include:

- Top row: Laboratory equipment (test tubes), a building exterior, a green fluorescent micrograph, a man holding a fossilized bone, a microscope, and two researchers in a lab.
- Second row: A dog behind bars, a man at a desk with a laptop and a fossilized animal, a hand using a pipette, and a green fluorescent micrograph.
- Third row: A man at a computer, a woman at a computer, a man at a microscope, and a woman at a microscope.
- Fourth row: A 3D surface plot, a glass dish with a sample, a man at a microscope, and a woman at a microscope.
- Fifth row: A man holding a fossilized bone, a man at a desk with a laptop, a man at a microscope, and a group of people at a table.

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00:02 **Central European Time** ▲
(CET) 10:02 on-board time
333km off the Antarctic coast

The drill ship *Joides Resolution* battles its way through the waves. Ursula Röhl, a marine geologist from the University of Bremen, Germany, and her colleagues pore over the data, gathered overnight from a core 4,000m below the surface. They discuss the porosity and magnetic properties of the sediment and agree that more data is needed before any conclusions can be drawn. But should they lower more drill strings in this weather? With another 2 months to reconstruct the glacial history of the Antarctic, the researchers of Wilkes Land Expedition No. 318—a part of the Integrated Ocean Drilling Programme—decide to wait out the storm.



02:05 14:05 local time ▲
Qilai Village, Fiji

William Camargo and his colleagues from the University of South Pacific set up floating cages and stock them with Tiger prawns, which are raised on a special diet optimised by the researchers. This experiment in aquaculture will provide the locals with a new source of income.

03:00 worldwide

Around 22,000 scientific papers are published across the world in the course of a day—and around 800,000 scientific journals are published every year. Although the majority of these are

in the USA and Europe, other regions are fast catching up. The number of publications in India and Brazil has increased tremendously, but the rise has been most dramatic in China. The country of 1.3 billion inhabitants is gradually becoming a superpower in science as well. In 1997, Chinese

researchers published 12,200 of the world's scientific articles; 10 years later, the number had already increased to 56,800—overtaking Japan, the UK and Germany. Should this trend continue, China could well outstrip the USA by 2020, and become the nation with the largest number of research papers.

00:20 31.1.10, 20:20 local time
Cerr Paranal, Chile

The Atacama Desert is bathed in twilight. From the control room of the European Southern Observatory, Linda Schmidtbreick adjusts the Melipal Telescope for the night. The 8m-long optical telescope, one of the four units of the Very Large Telescope here, will focus on the quasars.



03:08 11:08 local time
Tokyo, Japan

Masayuki Inaba and other students assist in positioning a robot called Kojiro on a bicycle. This humanoid, developed in the Robotics Lab of Tokyo University, possesses more than 50 microprocessors, 109 mechanical 'muscles' and an artificial backbone, which help it move almost as smoothly as a human. The scientists are still working on the final adjustments to achieve perfect coordination between the individual parts.

04:30 10:30 local time
Yogyakarta, Indonesia

Though Merapi has been more active this week than during the previous one, there is no cause for concern, says Subandriyo, as he studies the computer printouts of the seismic waves of Indonesia's most active volcano. This is part of his everyday routine as head of the Centre for Volcanological Research and Technology Development. Half an hour later, he sends off his report to the Geological Department of the Ministry of Energy in Jakarta.

06:00 worldwide

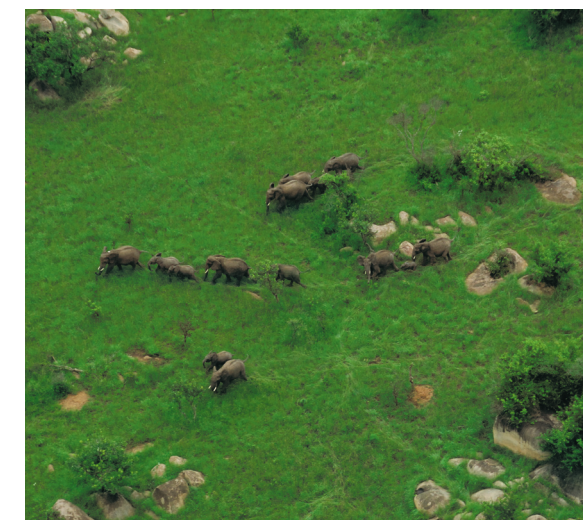
The day is just 6 hours old and 729.12 million dollars have already been spent on research globally: this will rise to about 1,156.5 billion by the end of the year. A recent study compared the world's 100 most research-intensive firms to find out how much was being spent on R&D despite the recession. Although 65 per cent recorded a clear slowdown and 32 per cent even booked losses, their spending on research increased by more than two-thirds.



06:02 10:32 local time
New Delhi, India

At Sridhar Sivasubbu's lab at the Institute for Genomics and Integrative Biology, Mondays are set aside for brainstorming. This molecular biologist at India's Council of Scientific and Industrial Research (CSIR) shares the view of Louis

Pasteur: chance favours the prepared mind. He discusses upcoming work with his Ph.D. students. In December 2009, in collaboration with Vinod Scaria, he succeeded in fully mapping the genome of an Indian—for the first time in India. Now, the researchers want to determine whether the genome shows a pattern that is unique, and therefore typical, to Indians. "Such a discovery could have repercussions on the future healthcare system of our country," says Sivasubbu.

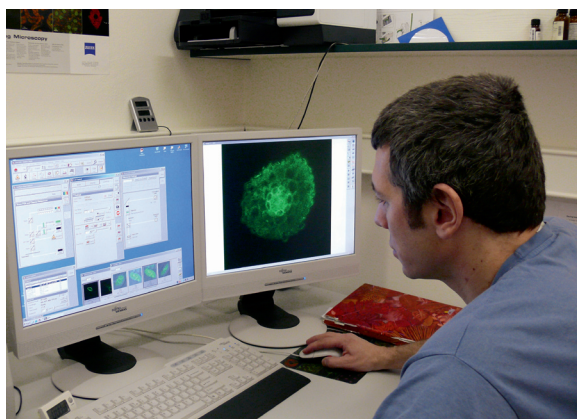


06:08 08:08 local time
Serengeti, Tanzania

Anna Estes is on her way to a small tin-shed hangar in the compound of Serengeti Wildlife Research Centre. The satellite transmitters on some of 'her' six elephants out in the jungle have fallen off. So she now has to use radio-tracking to locate the animals from the air, from the Cessna that belongs to the Frankfurt Zoological Society. Pilot Felix Borner helps her to fix a receiver antenna on the aircraft, and they are soon flying over the western part of the Serengeti. Estes is lucky: a chirp on her headphones helps her track down 'Unit 36', a female elephant she has been after for more than a year. Later, she will try to find the elephant on the ground so that she can replace the radio transmitter collar.

07:36 08:36 local time
Tel Aviv, Israel

Mel Rosenberg is out for his early morning jog, a brisk 5.5km from his apartment to the sea and back. Then the microbiologist, a specialist in the study of halitosis, drives to Tel Aviv University, where he and co-author Nir Sterer have been working on a manuscript on the use of coffee extracts to eliminate bad breath. They were to have submitted an article the previous day to the *Journal of Breath Research*.



08:15 CET
Prague, Czech Republic

Under Jan Petráek's confocal microscope are cross sections of thale cress (*Arabidopsis thaliana*). The researcher at the Institute of Experimental Botany of the Czech Academy of Sciences is studying the role of phytohormones in the plant's growth. This instrument, costing 500,000 euros, works with a laser light that stimulates a florescence from dyes applied to the specimen and identifies the location of the desired hormones and the molecules that carry them.

08:35 09:35 local time
Bloemfontein, South Africa

Good preparatory work makes all the difference: blue tape on the sterile containers for biological specimens,

green on the ones for geochemical samples. At the University of the Free State, Esta van Heerden, Elsabe Botes and Ruddy Banyini are getting things together for their expedition to the Beatrix Goldmine. The scientists will tunnel down 2,150m to look for new 'extremophiles': microorganisms that live under extreme conditions. Once the gear is all packed up, van Heerden helps a Ph.D. student analyse the culture of a recently discovered heat-loving protozoan under the microscope.

08:45 CET
Budapest, Hungary

In 2 weeks, Gábor Csorba will be in Cambodia searching for unknown species of bats—but today, he is hard at work at the Hungarian Natural Science Museum examining the results of an earlier expedition. Under the microscope, he looks for details such as the shape of teeth that could identify a particular species. Csorba had already identified 14 new species, each one strengthening the case for more reserved forests.



09:17 11:17 local time
St. Petersburg, Russia

Woolly mammoths were able to survive the harsh cold not only because they had three layers of fur, but because of their sebaceous glands. This is why Alexei Tikhonov peers into his microscope this morning, gazing at a specimen sample from a baby mammoth discovered in Jamal (in the Siberian peninsula) in May 2007. Tikhonov and his colleagues at the Zoological Institute of the Russian Academy of Sciences first established the existence of the sebaceous glands in 2008, though these glands could not be demonstrated in older specimens like baby Dima (*photo*), excavated in 1977. But if the sebum from the glands had not been present, the mammoths would not have been able to survive in the moist, warmer climate that followed the Ice Age.

09:21 CET
Freiburg im Breisgau, Germany

How can justice be ensured during a period of transition? This is the topic of discussion this morning between Nandor Knust, Anna Petrig and Jan-Michael Simon. These jurists at the Max Planck Institute for Foreign and International Criminal Law are trying to identify the best mechanisms for punishing the large-scale injustices that are often perpetuated after a conflict, like the genocide in Rwanda.

10:03 CET
Cologne, Germany

A series of fine 'peaks' of different heights appear on Mario Thevis' monitor—chemical 'fingerprints' of a new kind of doping drug detected in a urine sample by biochemists at the German Sport University in

Cologne. Known as Andarine, it is still undergoing clinical trials as a therapeutic drug for muscular atrophy, but is already available on the black market as a performance enhancer.

10:30 11:30 local time
Helsinki, Finland

Krister Wennerberg, of the Institute for Molecular Medicine Finland (FIMM), is working on a machine for high throughput screening—an automated method of testing several chemical samples simultaneously. Wennerberg and his team have developed a process for analysing up to 1,536 samples on one plate measuring just 13x8.5cm. On this, they can screen more than 100,000 samples a day, which they hope will enable them to find kinesin—a protein that could be the foundation for a new generation of cancer drugs that will target only the sick cells in the body.

11:01 10:01 local time
Bamako, Mali

In his office at the International Livestock Research Institute, Augustine Ayantunde adds the finishing touches to a report on the protection and use of indigenous ruminants in West Africa. N'dama cattle, Djallonke sheep and West African Dwarf goats are resistant to sleeping sickness, a disease that affects animal husbandry in humid regions. However, grazing pastures for these species are fast disappearing as people convert grasslands and forests into fields. Ayantunde is looking for ways and means to preserve the habitat of these animals in Gambia, Guinea, Mali and Senegal.



11:25 CET
Bratislava, Slovakia

Peter Fedor studies sections of a thrip, a pest whose subspecies cause considerable damage to harvests across the world. Fedor and his colleagues at the Faculty of Natural Sciences, Comenius University, are developing a computer programme that can quickly—and ‘intelligently’—identify these insects. The basis for the first stage of the programme is taxonomic data from thousands of thrips, data that has to be gathered with great precision. The scientists hope to use their new process to find ways of combating the bugs without destroying other species of animals or plants.

11:43 CET
Hamburg, Germany

At the test centre of the Technical University of Hamburg–Harburg’s Institute for Aircraft Systems Engineering, Dennis Doberstein manually unlatches the nose landing gear of an Airbus. Within 15 seconds, it descends all the way down through its own weight. The engineer replaces the conventional hydraulic actuation of the landing gear with an electrical one, hoping to demonstrate that the new construction will function even in an emergency, when electrical circuits fail.



11:58 worldwide

It's only noon, but MBA students at Harvard Business School, Boston, have already spent 100 dollars in fees today. The university topped Shanghai's Jiao Tong University's Academic Ranking of World Universities. Of the top 20 universities in the world, only three are non-American. The British universities of Cambridge and Oxford rank four and ten respectively.



12:00 13:00 local time
Istanbul, Turkey

Ümüt Cirit has just returned from the slaughter house. His colleagues at the Faculty of Veterinary Medicine, Istanbul University, open the container he has brought along and remove the sheep and cattle ovaries inside. They work quickly: Professor Sema Birler and her assistant get the sheep ovaries; Cirit and Professor Serhat Pabuccuolu get the cows'. They plan to extract the egg cells in order to clone a cow. The ovaries are cut open and a sterile, pH-neutral fluid is injected. The scientists then pick out healthy egg cells under the microscope; a few mother cells from these are selected for cloning. The aim is to preserve and develop Turkish livestock species. The scientists already have several such successful operations behind them; their first cloned animal was Efe—a male Anatolian Grey calf (a variant of domestic cattle of the *Bos primigenius taurus* species).



12:15 11:15 local time
Queen Maud Land, Antarctica
71° 10' S/6° 45' E

There is a snowdrift at gale force 9, so working outside is not possible. Olaf Eisen from the Alfred Wegener Institute for Polar and Marine Research and his four colleagues sit inside their portacabin, using the break to analyse data they have collected over the last few days. They are on their way from Neumayer Station to the Halfvarryggen ice dome, a candidate for a drilling-point of future ice cores. The ice sheet in the region needs to be checked out in advance. One part of this procedure requires the researchers to measure seismic waves generated with small explosions on the ice dome. Once the storm dies down, it takes the scientists many hours to extract their pistenbully—an all-terrain vehicle—from the snow.

12:20 worldwide

About 7 million people are employed in science globally. This means one in every 1,000 people is a scientist—at a university, a private institute or a public one, employed by a large company or part of a scientific society.

12:25 13:25 local time
Vilnius, Lithuania

Ph.D. student Domas Paipulas readies the laser machine at the Laser Research Centre of Vilnius University. He will use a hair-thin beam of bundled light to cut grooves in a steel plate. The work is part of an international project—with researchers from Lithuania, Denmark, the UK and Spain—to develop a method of identifying the microscopic cracks that develop in steel, for instance during metal fatigue. Scientists from another institute will fill the grooves with electrically conductive ceramic, creating a net. If the steel then develops cracks (not visible to the naked eye), the sites can be located by passing an electrical impulse through the net. A break in the current indicates the presence of a crack.



13:04 15:04 local time
Gadan, Iraq

A 20km-drive takes geologists Polla Khanaqa and Khalid Sharbazheri from their institute in Kurdish Sulaimania to the bare hills around the village of Gadan. Here, they look for a suitable site to examine 65-million-year-old rock layers. Calcium deposits from the shells of marine animals and geochemical analyses will help them to reconstruct the environmental conditions that existed in the region at the end of the Cretaceous Period—the era when dinosaurs became extinct.

13:31 12:31 local time
In orbit around the earth

Astronaut Timothy Creamer is floating in Columbus Laboratory on board the International Space Station, 350km above Siberia. He can see cubes and cylinders on the inbuilt mini-monitors of his headset: his task is to estimate the size and distance of these objects. The European Space Agency is using this experiment to determine how zero gravity affects spatial perceptions, for any error in judgement by astronauts while performing tasks outside the station could have grave consequences. "It seems that in space a cube is

perceived to be longer but less broad," explains Claudio Sollazo, who observes the experiment live from the control room in Oberpfaffenhofen, Germany.

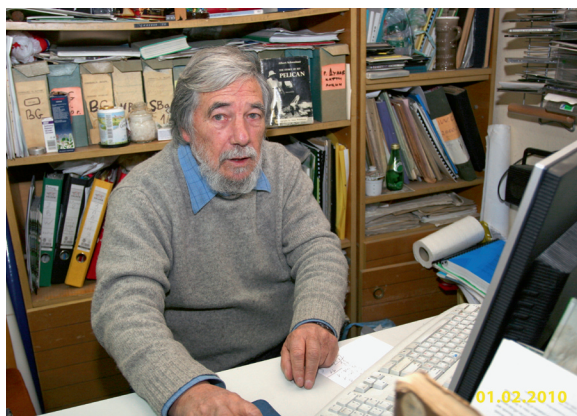
13:40 worldwide

The canteens of universities are packed—the numbers of students have been steadily increasing. About 500,000 people graduated in 1900; and just 100 years later, there were more than 100 million students enrolled in 20,000 universities around the world. In the following 7 years, the number of graduates increased by another 50 per cent to 152.5 million, with more women graduates than men.



13:47 04:47 local time
Barkley Canyon, 100km
off Vancouver Island

Wally's instruments record a pressure of 91 bar, a temperature of 2.81°C, and methane concentration of 0.02 milligrams per litre. The deep-sea crawler, part of the Neptune Seafloor Observatory, is 871m below sea level in a canyon. 'Wally' is connected to a relay station via a cable 70m long and sits on a field of methane hydrate, an ice-like mixture of methane and water that occurs in large quantities on the seabed and is a promising source of energy.



14:00 15:00 local time
Sofia, Bulgaria

At the Bulgarian Academy of Sciences, ornithologist Tanyo Michev is compiling a list of all sightings of Dalmatian pelicans in Bulgaria since the late 19th century. These statistics will form the base of a conservation plan commissioned by the Bulgarian Ministry of Environment. Just one nesting colony of Dalmatian pelicans is left in Bulgaria, in the nature reserve of Srebarna, on the Danube. Srebarna has around 100 breeding pairs and is one of the last of its kind in Europe. Michev, an expert on the habitat of the birds, says that to ensure its survival, extensive wetlands on both sides of the Danube would need to be set aside as nature reserves, and nesting platforms would need to be constructed on the island of Belene and in the Bay of Burgas.

112 GEO 7/10

14:02 CET
Zagreb, Croatia

Suzana Marjani and Maja Pasari sit in the library of the Institute of Ethnology and Folklore in Zagreb and prepare for a lecture. Their team is working on a project on 'Cultural Zoology', with in-depth research being conducted on the role animals have played in Croatian culture. The project involves scientists from Belgium and Slavonia and has already resulted in three books, the most important of which is called *Kulturni bestijarij* (A Cultural Bestiary).

14:29 13:29 local time
Exeter, UK

Gillian Kay has just completed her post-lunch walk and returned to her office at the Hadley Centre Met Office, the

UK's largest climate research institute. A quick glance at her computer shows that climate model calculations are still being processed. She will use this data to predict the effect of increased concentrations of greenhouse gases on the vegetation of South America 150 years from now. For the moment, however, Kay has to be patient—according to the status display, the simulation will take another 2.5 days to complete.

14:30 worldwide

Afternoons at universities are usually devoted to the reading and writing of scientific papers. However, only a small portion of reference material is actually referred to and cited. A mere one in 200 papers is cited more than 200 times by peers, thus qualifying it as 'important' research.



15:00 16:00 local time
Allaan, Jordan

Darweesh Foudeh, a radio frequency engineer, switches on the injector in the huge hall of the SESAME synchrotron and meticulously checks that all systems are functioning properly. Electrons shoot into a particle accelerator. The particles travel at almost light-speed, and emit an intense electromagnetic beam once in orbit. Researchers use this special 'light' to study biomolecules and archaeological finds.

SESAME is a joint project of nine Middle Eastern countries that include Egypt, Pakistan, Iran, Jordan, Israel and the Palestinian Authority. For the first time ever, under the aegis of UNESCO, researchers from different Arab states are working together with Israeli scientists, making SESAME an international showpiece for research that promotes peace. However, the project fulfils another important function as well—generating employment for about 1,000 scientists from the region and from many different specialisations.



7/10 GEO 113

15:44 CET
Rostock, Germany

Heavy snow has brought traffic to a halt, so Gerald Bieber of the Fraunhofer Institute for Computer Graphics Research is unable to go to work today. Instead, he uses his time to write an email to a clinic for obese children on Usedom Island. Rostock scientists are working with this centre to develop a mobile phone sensor that, like a tachograph, will display the movement patterns of its users. It is also used to record what they eat, so that energy input and energy consumption can both be analysed.



16:00 CET
Parma, Italy

Cinzia Di Dio sets up her Magnetic resonance imaging (MRI) system for an experiment. The neuroscientist from the University of Parma wants to establish how the brain reacts when a person looks at classical sculptures— and then determine exactly where these ‘cerebral signs of beauty’ register in the brain. As a contrast, she also shows volunteers deformed versions of the artworks. After all, the experiment is also meant to answer the question: is our sense of aesthetics purely subjective? Or does it have an objective biological basis?

17:30 11:30 local time
Havana, Cuba

Dr Gustavo Kouri stands in the midst of anatomical specimens in the museum of the Pedro Kouri Institute, which was founded by his father. He is surrounded by medical students from Argentina, Brazil and El Salvador, and answers their questions on tropical diseases— particularly about dengue fever, his area of specialisation. He is currently working on a vaccine for this mosquito-transmitted viral infection, as well as writing a book on the subject.

17:35 CET
Madrid, Spain

Juan Luis Arsuaga classifies the jawbone of a deer that was killed, likely by Neanderthals, in the Atapuerca Mountains of northern Spain during the last Ice Age of the Pleistocene Period. The prehistoric fossil was found in the Mayor Cave of Atapuerca—together with bones of wild horses and badgers, and some Neanderthal stone tools. The finds that Arsuaga and his team are studying at the Centre for Human Evolution, a joint research institute of the University of Complutense and the Carlos III University in Madrid, are between 40,000 and 50,000 years old. The biologists want to learn more about the animals that coexisted with the Neanderthals in Pleistocene Cantabria, and on which the latter must have depended.

18:00 17:00 local time
Niokolo-Koba National Park, Senegal

A family of warthogs dashes through a clearing in the savannah—a boon for Tabitha Price. The biologist from the German Primate Centre quickly presses the recording button of her recorder: how will the group of Velvet monkeys, the subjects of her research, react to this intrusion on their peace? Price turns the microphone towards a male



monkey emitting a series of short calls from the branches above her. Warning or showing off? Price hopes to gain new insights by comparing the call repertoire of the Velvet monkeys with that of related species.



18:30 14:30 local time
São Paulo, Brazil

Paulo Lee Ho’s task today is to clone the gene of the Brown recluse spider (*Loxosceles reclusa*), whose bite on a human arm or leg can, in rare cases, cause a slow atrophy of the limb, ultimately leading to amputation. The spider is commonly found all over the Brazilian state of Paraná. The biologist from Butanan Institute’s Centre for Biotechnology in São Paulo wants



to manipulate genes to develop an antiserum for the poison. If successful, the antidote would be another feather in the cap of this institute, which specialises in biopharmaceutical products. Scientists here have developed a vaccine against Hepatitis B, which, once mass-produced, costs just 27 cents (US), as compared to the 100-dollar tag it carries under the American healthcare system.

19:00 10:00 local time
Seattle, USA

In the Mass Spectrometer Laboratory of the Institute for Systems Biology, Ulrike Kusebauch is using an HPLC chip to identify proteins from a breast tumour. She pipettes the proteins into the 96 tubes of the tester. The biochemist hopes to find signal proteins that will allow early detection of breast cancer.

20:00 13:00 local time
Mexico City

Carlos Pallán’s window looks out directly at the sunny remains of the Aztec capital of Tenochtitlán. The archaeologist, however, is busy at his work table, tracing

glyphs on a digital tablet—which he had photographed on his last excavation in southeastern Mexico. Some of these signs are first transformed into electronic images. Before Pallán’s eyes appears the name of a hitherto unknown ruler of an unknown city: ‘Saktal Ajaw,’ or King of Saktal.

21:30 15:30 local time
Lexington, USA

Psychologist Richard Smith of the University of Kentucky has set his sights on a new emotion today:

‘*glückschmerz*’—unhappiness at another’s good luck. This emotion is closely related to ‘*schadenfreude*’ (pleasure at the suffering of others). Smith discusses with his students how the feeling of *glückschmerz* can be induced in an unsuspecting test subject. “We believe that people experience this feeling as often as they do *schadenfreude*,” says Smith, “but it has never been empirically tested.” Even the word to describe this feeling was created by Smith himself: he had to use the German expression since, like *schadenfreude*, no English equivalent exists.

23:20 CET
Basel, Switzerland

Andreas Schmidt lies down to sleep. The volunteer has just finished 2 hours of office work in Basel University’s blue-lit chronobiology laboratory. Sleep scientist Christian Cajochen rechecks the electrodes on Schmidt’s head. They will monitor the waves of the brain during the night. The Basel researcher believes that being exposed to light with a high proportion of blue leads to smaller concentrations of the ‘dark hormone’ melatonin in the blood and to shorter REM sleep. It’s an interesting theory, but is it correct? Cajochen will know more about it, only he’ll have to wait... until tomorrow. ■

