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The 3rd Workshop on Particle Physics, which is at the very frontiers of physics, was held from March 08 to 13, 2004 at the Department of Physics, Quaid-i-Azam University, Islamabad. This workshop was organized by the National Centre for Physics (NCP) and co-sponsored by CERN, Switzerland.

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Workshop on NanoTechnologies

A symposium on semiconductor and a workshop on NanoTechnologies is jointly organized by National Centre for Physics (NCP) and Pakistan Society for Semiconductor Science and Technology (PS³T). The Symposium and workshop will be held at Department of Physics, Quaid-i-Azam University, Islamabad on April 12-17, 2004.

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National Centre for Physics, Quaid-i-Azam University, Islamabad.
NCP Watch

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In the inaugural session on 8th March, Professor Riazuddin, Director NCP welcomed the guests and introduced to them the main objectives and motives, both of the workshop and the NCP. He announced that after 30-years of its incubation period starting with the International Nathiagali Summer College on Physics and Contemporary Needs, that Prof. Abdus Salam helped to launch in 1976, the Government of Pakistan has now approved the NCP as an independent institution. According to the charter given by the Presidential directive, the centre will establish itself on the lines of Abdus Salam International Centre for Theoretical Physics (ASICTP), Trieste, Italy and will evolve into a Centre of Excellence in the area of Physics, paying special attention to the needs of Pakistani universities and R&D organizations. It would seek to accomplish its mission by creating an international forum for the exchange of scientific information through comprehensive courses, workshops, conferences and seminars and by establishing linkage for collaboration in research with active international research centre like, ASICTP, CERN, DESY, INFN and Fermilab. He also mentioned some already existing collaborations with CERN, ASICTP and Third World Academy of Sciences (TWAS).

The workshop was scheduled on the basis of lectures and seminars followed by the discussion sessions. Based on the center’s motives to establish linkages with active international research centers, the invited speakers for the present workshop were Dr. Ahmed Ali (DESY, Germany), Dr. Daniel Denegari (SACLAY, France), Dr. Guido Altarelli (CERN, Switzerland), Dr. Gigi Rolandi (CERN, Switzerland), Dr. Carlos A. Salgado (CERN, Switzerland) and Dr. Jurgen Schukraft (CERN, Switzerland). Topics covered by the speakers were:

1. CP-violation and B-Physics by Ahmed Ali
2. Detectors for High Energy Physics by Gigi Rolandi
3. Standard Electroweak Model and Beyond by Guido Altarelli
4. ALICE: Detectors and its Physics by Jurgen Schukraft
5. Quark-Gluon Plasma by Carlos A. Salgado
6. Physics at LHC by Daniel Denegari.

Three supporting seminars were also delivered which included:

1. Neutrinos:A Source for Quantum Information by Dr. Kamaluddin Ahmad (Comsats Institute of Information Technology, Islamabad).
2. Proton Spin in QCD by Dr. Pervez Hoodbhoy (Professor, Department of Physics, Quaid-i-Azam University, Islamabad).
3. Study of Testbeam Data Using X5 Beam at SPS of CERN by Irfan Asghar (a Ph.D. student at NCP).
More than 50 research scholars and faculty members from different national universities actively participated in the workshop. On the last day of the workshop, Professor Riazuddin concluded the last session thanking all the speakers for giving the participants a clear exposition and for bringing them up to date. He appreciated all the participants for their eager involvement in the various activities of the workshop. Quoting Professor Salam, “Scientific Knowledge is a shared heritage of all mankind. East and West, South and North have all equally participated in its creation in the past and we hope they will in future. This joint endeavor in science is one of the unifying forces among the diverse people in this globe”, he said that science cannot flourish in isolation and as scientist we have to be in an international environment because that is why we can work in every culture and be useful to each other. He hoped that the activity would help the participants to promote their research abilities in emerging fields of physics according to international norms of productivity and originality. At the end, he also thanked Professor Hafeez Hoorani and his organizing team which included graduate students and rest of the staff at NCP for their active participation and excellent job.

For the lecture contents of Speakers visit:
http://www.ncp.edu.pk/PPW_Event.htm

**Workshop on Nanotechnologies**

In April 2004 there will be a symposium on semiconductors along with workshop of Nanotechnologies. The symposium and the workshop are jointly organized by National Centre for Physics (NCP) and Pakistan Society for Semiconductor Science and Technology (PS²T). The Symposium and workshop will be held at Department of Physics, Quaid-i-Azam University, Islamabad on April 12-17, 2004.

Tutorial lectures on selected topics in semiconductor science and technology by experts will precede the research talks in the relevant areas to benefit the student of various institutions in the country. The activity is expected to cover a broad range of topics of current interest in semiconductor science and technology including photovoltaic, solar cell technology based on silicon and other semiconductors, light emitting devices and semiconductor lasers and new quantum effects in nanostructures with their applications, wide-gap semiconductors.

The symposium will be directed by Dr. M. Zafar Iqbal and workshop will be conducted by Prof. Dr. Talat S. Rahman (Kansas state University), Dr. Ismat Shah and Dr. Zafar Iqbal.

More information is available at:
http://www.ncp.edu.pk/NT_Event.htm
NCP Watch

CMS Production Update

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Upcoming Conferences:

3rd International Bhurban Conference on Applied Science and Technology.
The 3rd International Bhurban Conference on Applied Science and Technology will be held from 07th to 12th June, 2004 at Pearl Continental Hotel in Bhurban, Murree, Pakistan. The conference will consist of following four activities
1. Control and Simulation.
2. Computational Fluid Dynamics.
3. Advance Materials.
More information is available at:
http://www.ibcast.org.pk

29th International Nathiagali Summer College on Physics and Contemporary Needs.
INSC have been organized every year since 1976. The scientific activities of INSC aim at a broad coverage of topics at the frontiers of knowledge in physics and allied sciences. The scientific program of 29th college has been divided into three activities.
1. Information Technology.
3. Workshop on lasers.
More information is available at:
http://www.ncp.edu.pk/insc
Windows on the Universe
New instrumentations and novel technologies are opening new windows on the universe and we are entering into a new era of precision cosmology.
The origin and evolution of the universe has fascinated man for millennia. Today the scientific community has confidence that we will be able to understand the universe, its composition and its evolution through the laws of physics. This confidence was lacking for most of recorded history. That we have it now is due to the introduction of new observational and theoretical tools. Enormous improvement in our knowledge of the structure of matter and the nature of energy has made it possible to gain detailed insights to understand Cosmos from its origin to the present. We have been able to recreate in the laboratory the conditions of the early universe one tenth of nanosecond after the big bang and after five years we will be able to extrapolate back to picosecond after the big bang. Without the progress made in particle physics in the late 1970’s including Nobel Prize – winning work of Sheldon Glashow, Abdus Salam, and Steven Weinberg, early universe cosmology was unthinkable.

Our view of the universe is based on hot big bang theory, which explains its evolution from the first fraction of a second to our present age, around thirteen billion years later. This theory rests on:

- Hubble expansion of the universe.
- Discovery of cosmic background of radiation (CMB) in 1964; this is the original blaze of the big bang, now cooled to 2.7¹ Kelvin (minus 270°C, just 3 degrees above absolute zero).
- Correct prediction of a large primordial abundance of Helium (24%). This was cooked by nuclear reactions when the universe was seconds old (first 3 minutes).
- Simulation of the early universe by recreating the conditions of the early universe in the laboratory (see figure 1).

We can see the universe 300,000 years after big bang by studying the microwave background radiation, which is a direct relic of the universe when it became transparent to electromagnetic radiation after atoms were formed. Fluctuations in the CMB radiation (at the level of a few parts in 10⁵) have been detected with angular resolutions from 7° to a few arc minutes in the sky. These indicate the first clumping of matter particles into cosmic structures, which is resisted by the repulsive pressure of photons. The net result was gravity driven acoustic – like oscillations. These oscillations left their signature in the anisotropy of the CMB. Since the amplitude and position of the primary and secondary peaks of these oscillations are directly determined by the sound speed (and hence, the equation of state) and by geometry and expansion of the universe, they can be used as a powerful test of density of baryons (visible matter) and dark matter and other cosmological parameters.
Physics Corner

Recent measurements of the fluctuations by an orbiting observatory called the Wilkinson Microwave Anisotropy Probe (WAMP) and their analysis have settled a number of issues about the universe, its age, its expansion rate and its composition. The age is now believed to be 13.4 billion years within an uncertainty of only 2 percent and its rate of expansion is 72 per trillion years. On the composition of the universe there is dramatic observation that the fraction of cosmic mass-energy residing in ordinary matter is only about four percent. Around 23 percent of the universe is made up of another substance, called dark matter, proposed twenty five years ago when it became clear that all the galaxies behaved as if they were more massive than they seemed to be. Their rotational velocities were found to be systematically larger than they should be if the galaxies were bound to the cluster by the gravitational attraction of the visible masses only. This implies that there must be some invisible mass that is required to be about 5 times larger than the visible mass to hold galaxies together in the cluster. Its origin is unknown. Many explanations – black holes, brown dwarfs and yet undetected particles very different from atoms have been suggested, none so far confirmed. The remaining 73 percent is a new discovery, called dark energy, that works against gravity on large scales implying that the expansion of the universe is speeding up, rather than decelerating. In essence what we have learned about the universe is largely restricted to four percent. The nature of ninety six percent is essentially unknown. One thing is certain that we have to go beyond the ordinary matter and radiation we already know. For the dark matter we have a real chance of learning within the next 5 to 10 years when we might discover a new type of matter at CERN, Geneva where world’s largest accelerator is being developed. Such a matter is predicted by a new symmetry in particle physics, called supersymmetry. For dark energy we have to wait unless or until there is a unified theory of space-time, trying to bring gravity within the same framework as other interactions. So far a viable quantum theory of gravity eludes us. It turns out that to achieve this one needs a higher dimensional space-time: four familiar space-time dimensions and six extra dimensions which are hidden. In one version of extra diversions, we are trapped on a 3-dimensional membrane in a higher-dimensional space-time, called brane. Only gravity acts in the extra dimensions, thereby dispersing the intrinsic strength of gravity, making it seems weak to us. This version makes predictions that are instigating tests both on small scales and at large accelerators. This highly speculative theory might not be enough towards understanding the 96 percent of the universe’s mass-energy that is still dark, but a step towards it.

In any case: “Physics will change even more …. if it is radical and unfamiliar… we think that the future will be only more radical and not less, only more strange and not more familiar, and that it will have its own new insights for the inquiring human spirit”. [J.R. Oppenheimer, Reith Lectures, BBC, 1953]. Even after 50 years this remains true.

This article is based on the seminar delivered by Prof. Riazuddin on 30th January, 2004 under the lecture series “Nobel prizes in Physics”. This was the 2nd lecture of the series held at COMSATS headquarters, organized by The Abdus Salam International Center for Theoretical Physics-Pakistan Chapter.
IBM Lands Two University Grid Projects

IBM scored two major grid-computing wins when the company revealed that both the University of Texas at Austin and the University of Oregon will implement its grid technologies on their campuses.

Plans for the University of Texas grid promise to be the largest university grid-computing project in the nation, supporting more than 50,000 students and 20,000 faculty and staff. Researchers and students at the University of Texas will use grid technology for simulations; data sharing and data-intensive calculations, including genomics and proteomics investigations; climate modeling; petroleum exploration; and environmental remediation. The UT Grid Portal, based on TACC’s GridPort3 grid portal toolkit, will enable direct use of all UT Grid systems.

Meanwhile, the University of Oregon is using grid computing, Linux, and IBM supercomputer technology to speed and improve the diagnosis of epilepsy, stroke, and depression. Researchers at the university's Neuroinformatics Center received a $1 million grant from the National Science Foundation to build an advanced grid-computing infrastructure for diagnosing and treating these and other brain-related conditions.

http://www.informationweek.com/story/showArticle.jhtml?articleID=18400615

'Nano-lightning' could cool computer chips

Jumping electric charges could waft breezes of ionised air through microchips, replacing the bulky, noisy fans that cool down today's computers. Researchers at Purdue University in West Lafayette, Indiana say their patent-pending technology could be built directly into a computer chip's heat sink to provide a faster, quieter and lighter cooling system than the alternatives.

In current designs, a metallic sink absorbs the heat generated by currents in the microchip and is cooled by mechanical fans. But as engineers squeeze more functionality out of smaller chips, they are finding that the fans cannot cool down the chips fast enough or are too big for the device. Heat is now a major factor limiting the size of laptops.

The Purdue technology is the first air-based system to produce a cooling rate similar to water - 40 watts per square centimeter.

The secret is producing the air-flow right at the wall of the heat sink. Blowing it down from above using a fan creates a cushion of stationary air that impedes heat dissipation. But the new system consists of 300 electrodes that ionise and then pump the air molecules across the surface.

On one side of the device are the negatively charged electrodes, bristling with long, slender carbon nanotubes to concentrate the electric field. When the voltage is switched on, electrons jump the 10 microns from the negative to positive electrodes. This knocks electrons off the air molecules to produce a cloud of positively charged ions. While the phenomenon is similar to lightning, it occurs at much lower voltages and no actual sparks are produced. The positive ion cloud then drifts towards a negative electrode, but before it gets there, the voltage is switched to another electrode in a different position. In this way the positively charged cloud is pulled across the surface, carrying heat as it goes.

**New hacking tool hijacks file-sharing networks**

Computer hackers have started using peer-to-peer networks to remotely take over hordes of "zombie" computers, adding yet more malicious capability to the hackers' tool-kit. Network administrators at universities from Europe to the US recently detected the tool, a worm called Phatbot, on their machines. Phatbot is currently under analysis by the US Department of Homeland Security, in conjunction with a group of security analysts. Phatbot represents a new way for hackers to send spam and launch denial of service attacks that bring down websites by flooding them with traffic. Like most stealthy computer worms, it is a piece of malicious, executable computer code posing as an innocuous program, called a Trojan Horse. It invades a computer through a security flaw in Microsoft Windows. Once it has successfully infected a computer, it disables security programs such as firewalls and anti-virus software, scours the hard drive for email addresses that it can use for spamming and attempts to spread itself to new computers. It also opens "backdoors" in the operating system that turn the computer into a zombie controlled remotely by the virus writer. For virus writers to issue orders to these infected computers, they need a virtual assembly point where they can talk to all the computers at once.


**Multimedia PC with instant start-up launches**

Why can't a PC simply turn on like a TV?" It is the question that has been bugging people who use multimedia PCs as the heart of their home entertainment systems.

InterVideo of California launched the InstantOn PC. Instead of having to wait for Windows to boot, the technology allows all a PC's entertainment functions - TV, DVD, CD, MP3, and radio - to be run on a pared-down version of the open-source Linux operating system, called LinDVD. LinDVD is small enough to be held in a read-only memory chip and boots in 10 seconds flat.

For consumer electronics activities, the InstantOn PC is strictly Linux. It simply uses Windows for the slower drudge work like word processing.

InterVideo developed the InstantOn technology in collaboration with Intel, IBM and Sony. Its system lets LinDVD and Windows coexist in the same computer, running on a Pentium 4 processor and a minimum of 128 megabytes of RAM. When the "on" button is pressed, the software loads in less than 10 seconds, giving all but instant access to TV, CDs or DVD movies. MP3s, photos and videos filed by Windows will also be accessible in this mode. But if the user wants to do some work, they use a remote control to switch off the LinDVD software and the PC re-boots to run Windows.

The software makes boot-up faster by "pre-fetching" chunks of software from the hard disc while the PC is booting drivers for peripherals such as scanners and printers. Boot-up should take less than 30 seconds, says Microsoft, but most PC owners with multiple add-ons, such as cameras, TV tuners, broadband modems and various USB storage devices, have to wait some minutes.

Programming and Portability Tips

1- Always initialize counters and totals.

2- Declare each variable on a separate line.

3- Unary operators should be placed next to their operands with no intervening spaces.

4- Control counting loops with integer values.

5- Indent the statement in the body of each control structure.

6- The keystroke combinations for entering end-of-file are system dependent. i.e. Ctrl + D for Linux and Ctrl + Z for Windows.

7- Testing for the symbolic constant EOF rather than -1 makes programs more portable. The ANSI standard states that EOF is a negative integer value (but not necessarily -1). Thus EOF could have different values on different systems.

8- Because ints vary in size between systems use long integers if you expect to process integers outside the range -32768 to +32767 and you would like to be able to run the program on several different computer systems.

9- For compatibility with earlier versions of C++ standard, the bool value true can also be represented by any non-zero value and the bool value false can also be represented as the value 0.