First collisions at RHIC. A high-energy collision of gold ions at the RHIC as recorded by the STAR detector. Shown here is an end view (left) and a side view (right) of the collision of two gold ions (Courtesy: BNL).

The rings and allowed to collide (at six areas where the circulating beams cross) at the rate of tens of thousands of collisions per second.

When the relativistic ions in the beams collide head-on, all that high energy will be concentrated in a space about the size of an atomic nucleus and matter in that region will reach a temperature exceeding a trillion \((10^{12})\) degrees, lasting only a few billionths of a second, but hot enough to ‘melt’ the ions into their component quarks and gluons. Thousands of particles are emitted following such a head-on collision. Each of these particles is a clue to what happened inside the collision zone. If a RHIC collision produces a QGP, it will quickly cool, expand and condense into hadrons. Physicists will be able to determine if a QGP was produced not by observing it directly – its lifetime is too brief – but by looking at the particles that shower out from the collision. A collision that produces QGP will send out different kinds and ratios of particles than a collision that does not produce QGP. The data from millions of these high-energy collisions may provide definitive evidence if quark–gluon plasma was formed.

In addition to colliding heavy ions, RHIC will also be able to collide single protons. The proton beams will be ‘spin polarized’, that is, all the protons in one beam will be spinning in one direction and the other beam will contain protons all spinning in the opposite direction. RHIC is the first machine in the world capable of colliding such beams head-on. Physicists want to measure and understand how different factors influence a proton’s spin. Experiments elsewhere have shown that the spins of the quarks (and antiquarks, in some cases) inside particles such as protons accounts for only about 30% of the particle’s overall spin. RHIC spin experiments should provide the first information on how much the spin of gluons contributed to the proton’s spin, a contribution which recent theoretical work suggests may be large. If the quark and gluon spins together still do not account for the proton’s spin, the only remaining source available to ‘balance the books’ is the movement of quarks and gluons relative to one another. Thus, RHIC’s measurements of the spin substructure of the proton may lead us beyond our current understanding of how quarks move inside protons and other particles.

In a press release on 15 June 2000, BNL announced that scientists at the laboratory have begun detecting head-on collisions between gold nuclei in the RHIC. The first spectacular images of particles streaming from a collision point were produced generating a fireworks display of roughly 1,000 symmetrical particle-tracks by the STAR detector on the night of 14 June at 9 pm (Figure 1). The collisions were also seen by the PHOBOS detector early the next morning. The collider then began steering beams to the BRAHIMS and PHENIX detectors.

“These are the most spectacular subatomic collisions ever witnessed by humankind, representing the culmination of many years of hard work”, said Satoshi Ozaki, associate laboratory director for RHIC.

The collisions have been with beam energies of about 30 GeV per nucleon, four times more energetic than the collisions at CERN. Eventually, the ions will be accelerated to collide at energies of 100 GeV per nucleon in each beam – resulting in collisions approximately ten times more energetic than those at CERN. It is anticipated that the first results after analyses may be available sometime at the beginning of next year.

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**Malaria and the modified mosquito**

Are you living in a tropical or subtropical country? And scared of contracting malaria as you have run out of mosquito repellants or mosquito nets? Panic no more, have a bite. It could be a modified mosquito soon.

How can an *Anopheles* mosquito, bite and yet not transmit the infectious disease? This has been made theoretically possible in a report published recently in *Nature* by a team of researchers from the Imperial College of Science, Technology and Medicine, London, European Molecular Biology Laboratory, Heidelberg, Germany and the Institute of Molecular Biology and Biotechnology, Research Centre of Crete, Greece. They have demonstrated the first reliable system for exogenous gene transfer technology of an *Anopheles* mosquito carrying the dreaded disease, malaria.

To achieve this, the transposable element *Minos* from *Drosophila hydei* was
RESEARCH NEWS

A new, broad-spectrum anti-tubercular drug on the horizon

Pawan Sharma

*Mycobacterium tuberculosis* (Mtb), the causative agent of tuberculosis (TB), has emerged as the single most devastating, global pathogen. With nearly eight million new cases of active disease and three million deaths on its account every year, TB has displaced malaria to claim the dubious distinction of becoming the topmost killer infection of the world today. In India alone, TB accounts for nearly half a million deaths from nearly two million new cases each year, and as such represents a large proportion of the global TB burden. Furthermore, it is estimated that one third of the entire human population is infected with Mtb. This large population with latent infection serves as a reservoir for continuous emergence of fresh cases with active disease as epidemiological studies have indicated that nearly 10% of these would develop active disease sometime in their lifetime. Unfortunately, the disease is expected to continue to spread without respite unless novel diagnostic, treatment and intervention measures become available. The only anti-TB vaccine available today, viz., the Bacilli Calmette-Guérin (BCG) has had little impact on the overall TB prevalence worldwide. The current anti-tubercular drugs are toxic and limited in their activity and the treatment regimens are extremely long and difficult to sustain. The pandemic of HIV infection which dramatically increases susceptibility to develop active TB and the emergence of drug-resistant strains of Mtb in several parts of the world have further exacerbated the situation. There is, therefore, an urgent need for developing new vaccines and drugs to stem the spread of TB.

Until about fifty years ago, no drug was available for treatment of TB. Today, Mtb strains resistant to several drugs have appeared all over the world. The fact that no new drug with novel mechanisms of action against the tuberculosis bacillus has appeared in the last three decades, underlines the tough challenge posed by this pathogen. Against this background, it is heartening to come across a recent report by Stover and colleagues about development of a new, small-molecule drug candidate. Its unique anti-tubercular properties make it far superior to the current anti-TB drugs. This compound belongs to the family of bicyclic dimetridazoles originally developed as radio-sensitizers in cancer chemotherapy. These were found to possess antitubercular activity as well, but because of their mutagenicity, were not investigated subsequently for further development. Stover et al., however, synthesized a series of more than 300 3-substituted nitroimidazopyran (NAP) compounds and found that more than 100 of these possessed substantial, specific activity against the tubercle bacil-