

stone with dropstone on the roche moutonnée from Salto, to cross-bedded and “convoluted” sandstone beds in the river channel, toward NW. They are interpreted as proximal and distal glacial facies respectively, associated with an advance and retreat of the glacier.

Those rocks are overlain by an extensive and thick shale (pellitic) section that may represent the deposit of a marine transgressive post-glacial episode. Dropstones in the shale denote presence of icebergs and permanence of glacial influence during sedimentation. — ( *December 14, 2001* ) .

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#### MULTIDISCIPLINARY THEMES

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#### EFFICIENT ALGORITHMS FOR PACKING BOXES INTO CONTAINER

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The problem of packing boxes into bigger boxes (containers) is a practical problem which, by its economical significance, deserves a serious and inspired scientific approach. From a strictly mathematical point of view, it is an incredibly challenging problem which badly needs good heuristics to solve it. We have been involved in trying to find such heuristics since 1997. These heuristics use new concepts in graph theory (the tets), in data structure (the phormas), and used some classical algorithms as topological sorting and the coding of combinatorial objects to approach real world packing problems. A distinguished feature of our approach is the visual treatment of the spatial packing: we produce a sequence of homogeneous increments (a loading plan) in the packings which makes it easy to visualize and to actually produce the solutions found.

We have produced a set of effective heuristics for dealing with real world box packing problems: we permit various types of boxes, various types of containers, demand requirements on the boxes and the information on which box types can change its vertical direction. The implementation of our heuristics produces very good packings as compared with non-scientific ones: typically we

put 7% to 12% more boxes. The full paper related to these matters is scheduled to be published this year (2002) in the European Journal of Operations Research.

A computer package named ExpedPlex is under development, where the pertinent algorithms are being efficiently implemented. — ( *May 24, 2002* ) .

#### MAGNETOMETRY USING SQUID

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Presented by ANTONIO CID B. DEARAÚJO

Superconducting Quantum Interference Device (SQUID) is by far the most sensitive device ever built. It is a magnetic flux detector that can be used to measure magnetic field as low as few femtoTesla. Because of its high sensitivity, SQUID are being employed in detecting magnetic field generated by neural brain activity, non-invasive detection of metallic pieces inside the human body, nondestructive evaluation of corrosion and flaws, and in characterizing magnetic properties of materials, just to list few applications. Perhaps, the main limitation to replace most of the available magnetic sensors with SQUID's is the need of using liquid helium to operate them. However, with the recent progress made in the high temperature superconductor research field, there are SQUID being built that operate with liquid nitrogen and this makes them even more attractive.

Nowadays, there is a couple of companies around the world which sales SQUID magnetometers. However, they are too dedicated with almost no flexibility, the price is still too high and it is quite difficult to get maintenance when they fail. Another drawback is that these systems are true black boxes, not allowing graduate students and technicians to be trained in this very important technology. In my talk, I will describe a homemade magnetometer that uses a SQUID as the sensing element to investigate magnetic properties of materials. Our SQUID system operates from room temperature down to 1.5 K in a superconducting solenoid that generates magnetic field as high as 8 T. The SQUID system is particularly important when only a small amount of the magnetic material is available or to investigate system that presents weak magnetism. Some results of the magnetic studies made in magnetic polymers, thin-films and manganites will also be presented. — ( *May 24, 2002* ) .