In the case of the O_3 band, a satellite platform is required to avoid absorption by the Earth's atmosphere. A more careful investigation, such as for instance the DARWIN project submitted to the European Space Agency, shows that it is even necessary to go to 3.5 AU or more from Earth to suppress the IR background of the zodiacal light.

The detection of planets around main sequence stars other than the Sun remains a major astrophysical and instrumental challenge. Today, one confirmed planetary system has been found, but at a place where almost nobody expected it (around a pulsar). There are also two possible candidates, but they need to be confirmed. Another intriguing result is the lack of giant (with a mass equivalent to $\approx$ 2 Jupiter masses) planets around the nearest bright stars.

Several ambitious programmes are in sight, and some of them will even be capable of detecting habitable planets and eventually signs of life. But perhaps more encouraging is to be able to assist in the awaking in Europe of a field that has the potential to greatly influence not only science but also our understanding of life.

Updates of this paper are accessible on the World-Wide Web in the Extrasolar Planets Encyclopedy as http://mesiop.obspm.fr/schneider/plan/encycl.html

---

POSITRON MICROSCOPY

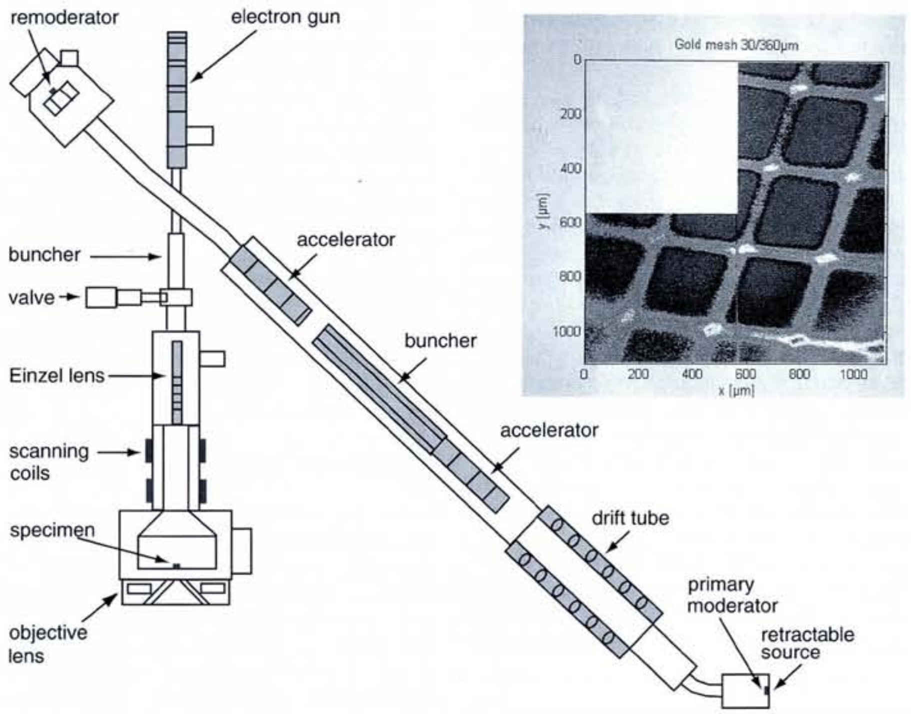
Pulse Microbeam in Operation

The primary beam of a positron scanning microscope based on using the positron lifetime technique to detect defects such as vacancies or voids [see *EN* **25** (1994) 178] recently passed final tests (the electro-optical column, the second part of the device — see figure, is presently being tested in Munich). Spatial resolution was tested by scanning the beam across a gold grid placed at the image position of the last lens. The image (see figure) is not yet a lifetime image, but a contrast image which allows one to estimate the spatial resolution as being better than 20 μm. It compares very favourably with the few images produced in the last years using positron beams. The novelty is that it has been obtained with a pulsed beam. The time resolution achieved with the primary column is close to 350 ps. Planned refinements should allow a pulse duration of the order of 150 ps to be reached. The beam will then simultaneously exhibit a spot size and a time resolution close to the best values achieved until now in separate systems. The energy of the positron beam will be variable from 1 to 30 keV. In this way the positron implantation profile can be varied and a non-destructive depth profiling of the sample made possible.

The lifetime method has been used over the last 25 years with positrons from radioactive sources (depth resolution of the order of 100 μm; lateral resolution of the order of a few millimetres). More recently, it has been used with pulsed positron beams of a few mm in diameter. In both cases, the possibility of distinguishing up to four types of defects has been demonstrated; the defect concentration can be obtained from the intensity of a given lifetime component. The positron microscope will perform the same kind of measurements on a pixel size of the order of a few square microns. Scanning the beam over the sample surface will produce a two-dimensional defect image and energy scanning will allow the generation of three-dimensional images with a variable depth resolution (of the order of 10 nm at depth of 100 nm, increasing to some 500 nm at a 2 μm).

The other type of positron microscope is based on re-emission. A beam of moderated positrons from a ^{22}Na source is focussed on the sample and the untrapped, re-emitted positron intensity is magnified and then imaged using a two-dimensional positron-sensitive detector. A 10^4-fold magnification of the re-emitted positron distribution has been achieved. Prototypes based on this approach, which is is limited to metals that re-emit positrons and to the study of surface features that affect positron emission (as opposed to near-surface structures), have been constructed in the US (Brandeis) and the UK (East Anglia).

A. Zecca, *Trento*



Schematic layout of the scanning positron microscope which aims to produce a few microns spot size. The project is being carried out at Trento University and at the Universität der Bundeswehr in Munich under a European Union BRITE-EURAM grant. The inclined pulsed beam system on the right is integrated with a specially designed electron microscope shown on the left. It demagnifies the spot to about 20 μm and generates 300 ps pulses. The electro-optical column will reduce the spot diameter down to a few mm and the pulse duration to below 150 ps. It will also scan the beam over the sample and control the beam energy. The novel design of the primary beam system allows a high transport efficiency even with the losses owing to beam pulsing (the 1 mCi ^{22}Na source yields 5000 positrons per second in the 20 μm spot). This implies that easy to handle, relatively cheap positron sources can be used. Inset is the contrast image of a gold grid (360 μm mesh size; 30 μm wire diameter) generated by scanning the primary beam.

Corrigendum

The following sentence should be added at the end of the article *"Positron Annihilation: Industrial Applications Develop"*, published in *Europhysics News* **25** (1994) 178: «This workshop has been made possible through the financial support of the Royal Netherlands Academy of Sciences and of the European Commission's Directorate-General XII». Furthermore, in the last sentence of the figure caption on p. 179, the word "delocalization" should read "localization".