

On The Trail of the Fathers: The Serendipitous Santos

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Introduction

I am a botanist, with an expertise in plant anatomy, specifically wood anatomy. In my capacity of microscopist for the Smithsonian Institution, I help answer research questions developed by curators, conservators, anthropologists and archaeologists. I am typically presented with a variety of materials that range from large, entire objects from museums to small, deteriorated, fragmentary samples from archaeological digs. Many of the requests center around the questions "What is it?" and "Where did it come from?" The answers to these questions help determine the traditional materials used by a culture and the distribution of these objects through trade and cultural exchange. Of the numerous requests that I receive, one or two each year tend to stand out as captivating examples of applied optical microscopy. The one that I would like to present in this article (along with my intern for the project - Alvaro Galvis) is the early Catholic statues (*santos*) from Chihuahua, Mexico and southern California.

Santos (Fig. 1.) are statues of saints and other religious personalities common in Hispanic communities, world-wide. The *santos* from this study were constructed over 300 years ago by European craftsman and the Tarahumara at a time when the Jesuit missionaries were introducing Catholicism to Mexico. What makes the *santos* of this period unique is that the wood used for the arms and legs was very light and not recognized as a commercial timber. The samples of unknown identity were tentatively called "lightwood". Using a combination of light microscopy, ethnobotany, detective work and pure luck (serendipity), it is now known that the "lightwood" comes from the genus *Erythrina*. Commonly known as *colorín* or *chilicote*, the plants of this genus have been known to have both medicinal and religious value to the Tarahumara (Schultes and Hofmann, 1979). This "signature wood" in the

santos of the Chihuahua Missions allows one to determine where the *santos* were created, and its presence in the *santos* of the Early California Missions elucidates their dissemination.

Microscopical Wood analysis of Santos from Chihuahua missions and from San Luis Rey mission in California

Wood samples from *santos* were prepared by trimming each to expose the radial, tangential and transverse surfaces. For each of these surfaces, thin (15-20 μ m) sections are removed by hand with a single-edge razor blade. The sections are then mounted on labeled microscope slides in a 1:1 solution of ethanol and glycerin. Slides are heated briefly on a hot plate, to drive off air bubbles and then examined under a compound microscope. The results can be seen in Table 1.

Wood Type	Chihuahua % of samples	San Luis Rey % of samples
Basswood	0.0	3.3
<i>Cedrela</i>	0.8	3.3
Douglas Fir	0.0	1.7
Fir - European	0.8	0.0
<i>Juniper</i>	1.6	1.7
<i>Erythrina</i>	14.3	25
Mahogany	0.0	3.3
Pine (combined)	71.4	36.7
<i>Populus</i>	0.8	0.0
<i>Sequoia</i>	0.8	0.0
Unknown	2.4	25.0
Walnut	1.6	0.0
Willow	5.6	0.0
Total Samples	126	60
Total Santos	65	28

Table 1. Percentage of wood types found in *santos* used in this study.

The main woods used in construction of the *santos* are pine (*Pinus*) and *Erythrina*. It appears that some of the *santos* may have been brought to North America from Europe, based on the woods used. I would



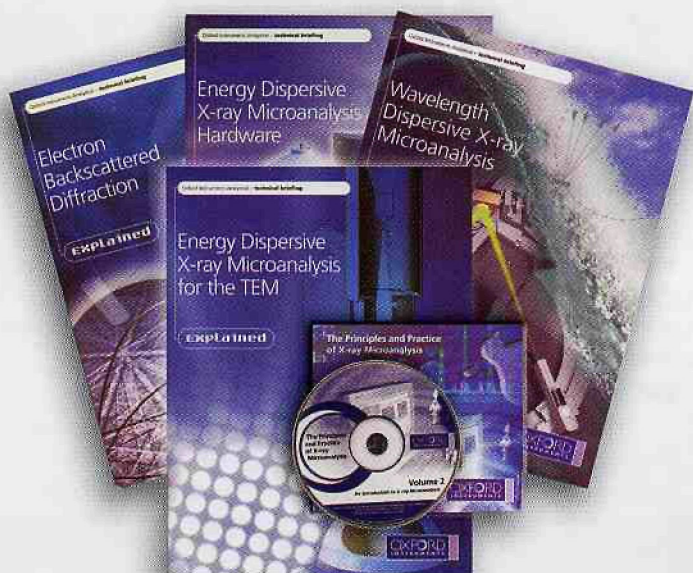
Fig1. Four *santos* with arms and legs made of *Erythrina* (left two from the Chihuahua Missions, and the right two are from Mission San Luis Rey in California).

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and legs of the *santos*. *E. flabelliformis* is native to central Mexico, southern Baja and the southern borders of Arizona and New Mexico. A large number of common, vernacular names are reported for *E. flabelliformis* from Mexico that includes the following: chak-mool-che, chijol, chilicote, chocolin, colorín, madre chontal, patol, pito, purenchequa and pureque (Standley, 1920; Martinez, 1969).

Erythrina flabelliformis are trees with spines on the branches and leaves that are pinnately compound (trifoliolate). The brilliant, blood-red flowers are grouped together at the extremes of the branches (below), giving the plant an ostentatious appearance. The fruit of this plant is a pod with bright red, smooth seeds (Martinez, 1969; Standley, 1920)

The reddish beans of *Erythrina* are known to have poisonous properties and have been reported as hallucinogens by the Tarahumara. There is some confusion about the latter attribute, as the seeds resemble those of Mescal Bean (*Sophora secundiflora*), which are hallucinogenic. Both types of seeds are frequently interchangeable and are sold together in modern Mexican markets under the name colorines. (Shultes, 1969; Merrill, 1977).

Optical microscopy of *Erythrina*

Erythrina is not a commercial wood, but one species (*E. flabelliformis*) is included as a minor western hardwood in *Atlas of U.S. Trees, Volume 3* (Little, 1976). This appears to be the only species that grows large enough (and produce enough wood) to be a viable candidate for the appendages of the *santos*.

It is characterized by the abundance of parenchyma, like balsa (*Ochroma* sp.), but has intermittent fiber bands, storied parenchyma,

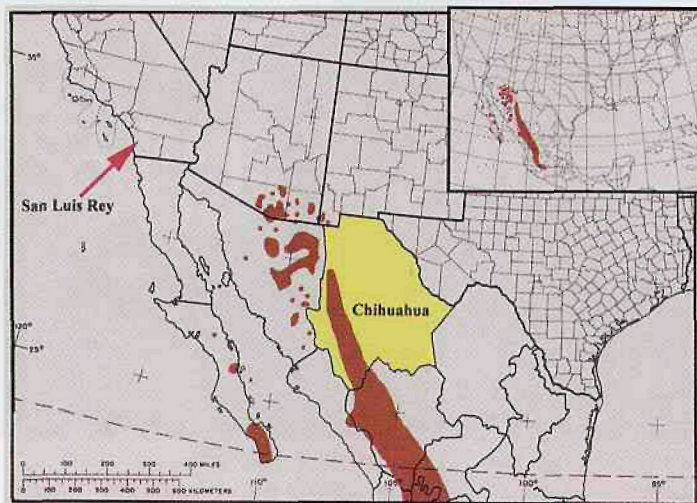


Fig2. Map of study area, showing the growth range of *Erythrina flabelliformis* (brown area), the state of Chihuahua (yellow) and the location of Mission San Luis Rey (arrow).

expect that the *santos* that are made of Basswood (*Tilia* sp.), Douglas Fir (*Pseudotsuga menzeisii*), European Fir (*Abies* sp.), and Sequoia (*Sequoia* sp.) are in this category because these woods are not native to northern Mexico or south western United States. The *santos* that contain Cedrela (*Cedrela* sp.), Juniper (*Juniperus* sp.), and Mahogany (*Swietenia* sp.) may also have been made elsewhere, but also may have been available to the Tarahumara. Juniper is a traditional wood used



Fig3. Flowers of *Erythrina flabelliformis*.



Fig4. Seeds of *Erythrina flabelliformis*.

in religious objects from Europe and both Cedrela and Mahogany are the most common woods used for *santos* in the Caribbean.

The genus *Erythrina*

A genus belonging to the bean family (*Fabaceae* / *Papilionoideae*), *Erythrina* consists of 108 species of wide distribution in the tropical portions of the world (Schultes and Hofmann, 1980). In Mexico alone, there are 18 species of *Erythrina*, with only Colorín (*E. flabelliformis*) being a large enough plant to be used for the construction of the arms

wide rays and numerous prismatic crystals and crystal sand in the storied parenchyma. All anatomical characters of the wood of the "lightwood" samples match those of *Erythrina* reported by Barajas-Morales & Gomez (1989) and by Barajas-Morales, *et al.* (1997).

The Role of *Erythrina* in the Tarahumara

The use of *Erythrina* by the Tarahumara prior to the Jesuit missionaries is significant as the seeds have been found in burial sites inside storage vessels as possible burial offerings (Zingg, 1940). The



Fig5. Macroscopic view of *Erythrina* wood.



Fig6. Close-up of figure 5, showing red fiber bands (arrows), vessels (V) and rays (arrowheads).

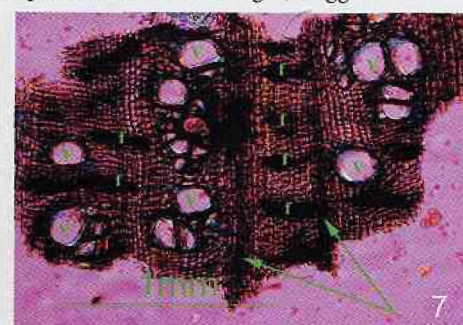
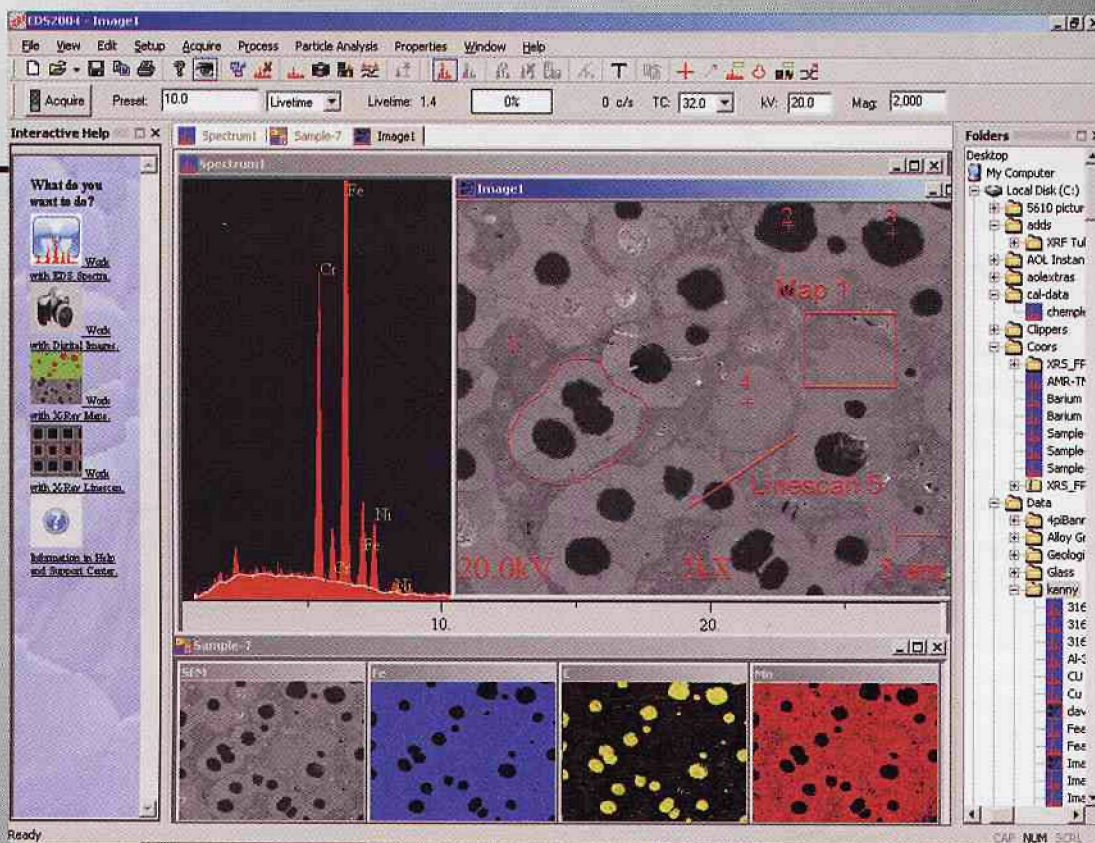


Fig7. Cross section of *Erythrina* sample, showing rays (arrows), vessels (V) and fiber bands (f).

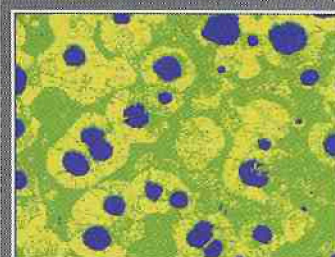
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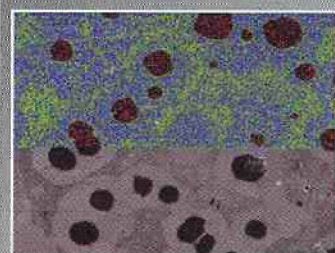
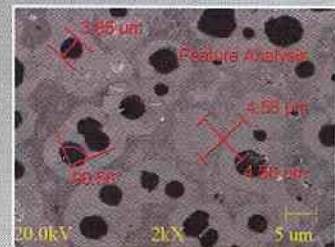


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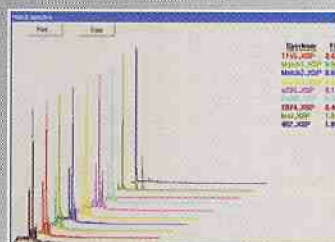
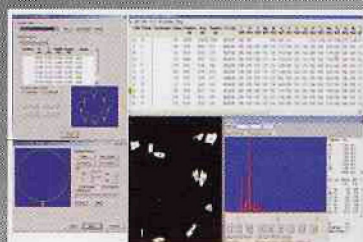
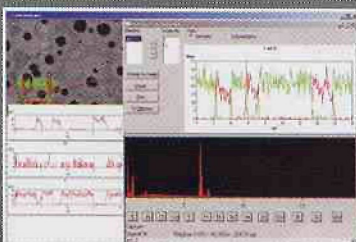
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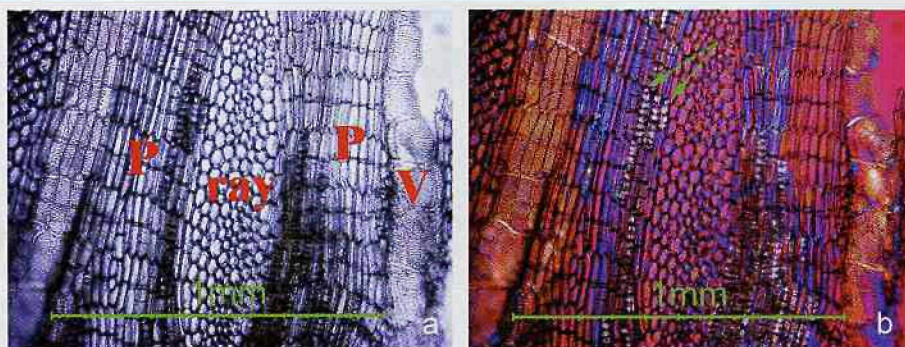


Fig8. Tangential section of *Erythrina* sample, showing a ray, a vessel (V) and axial parenchyma (P), in normal light (l) and circular polarized light (r).

red seeds of *Erythrina*, have been used to create necklaces and rosaries (Bye, 1978) These particular rosaries or necklaces are used in ceremonies performed after a family member has passed away. The seeds are also used as a form of protection, in particular for small children, as necklaces that have a cross or a medal of a Catholic saint (Merill, 1988). Medicinally, the red seeds have been employed cautiously by the Tarahumara to treat intestinal disorders, toothaches and as an emetic (Pennington, 1963. Bye, 1978. Schultes and Hofmann, 1980).

The use of *Erythrina* in the arms and legs of *santos* may be due to replacing of broken appendages. Arms, legs and other protrusions from the statues (staffs, banners, etc.) are usually the first parts of the *santos* to become broken. I feel that the choice of *Erythrina* wood was intentional. Other woods like Cedar (*Juniperus* sp.), Willow (*Salix* sp.) and Cottonwood (*Populus* sp.) may have been available to the Tarahumara. These woods are easily carved and are stronger and more durable than *Erythrina*. Many of the *santos* constructed with wood from *Erythrina* are painted with bloody wounds. There may be more than a symbolic coincidence between the blood streams and the deep red flowers of *Erythrina*.

Conclusion

The Tarahumara have had a long history in using *Erythrina* both for its medicinal properties and its religious values. The use of *Erythrina* wood in *santos* may be a case of cultural blending, either blatant or secretive, where the raw materials of their aboriginal cultural icons were incorporated into Catholic *santos*. This would allow the Tarahumara to accept Catholicism without abandoning their cultural "roots" so to speak. Alternatively, the Tarahumara were forced to accept Catholicism by the Spanish and thus like many other native peoples, were forced to hide their traditional beliefs. The *santos* provided such a tool. *Santos* were seen as protectors by the Tarahumara. In the eyes of the missionaries the natives seemed to be converting to Catholicism, but in reality were worshipping their traditional protector, *Erythrina*. ■

Acknowledgements

We are greatly indebted to Karla Munoz-Alcocer for collecting the wood samples from *santos* of the missions in Chihuahua, Mexico and Mission San Luis Rey in California. We also want to thank her for her interaction with the Tarahumara, who suggested that we investigate the use of *Erythrina* and for her assistance in

obtaining *Erythrina* samples from Chihuahua.

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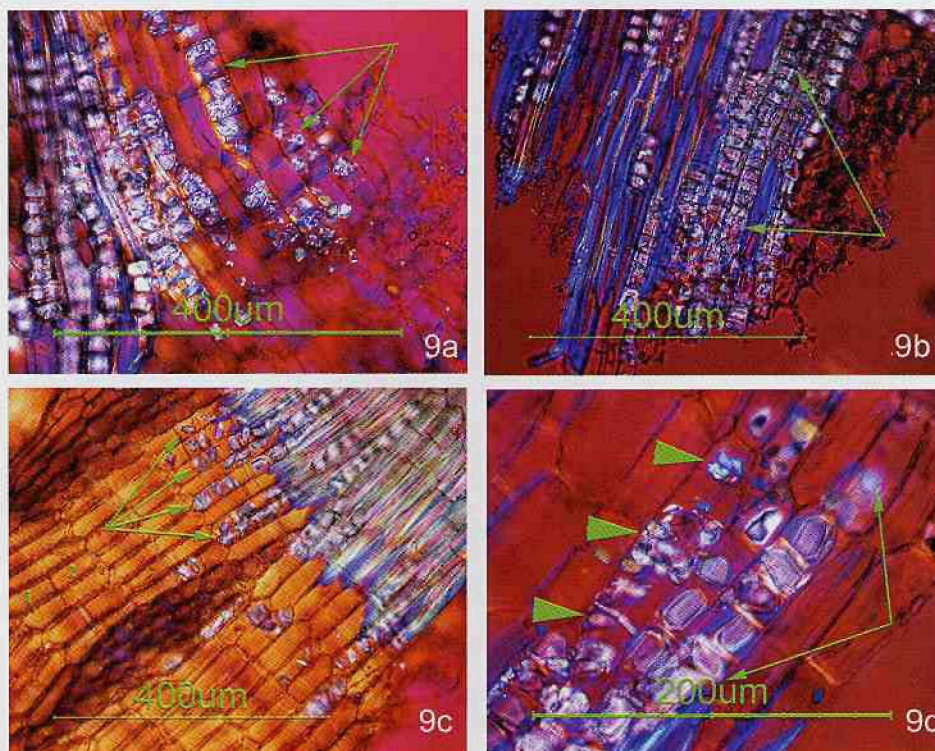
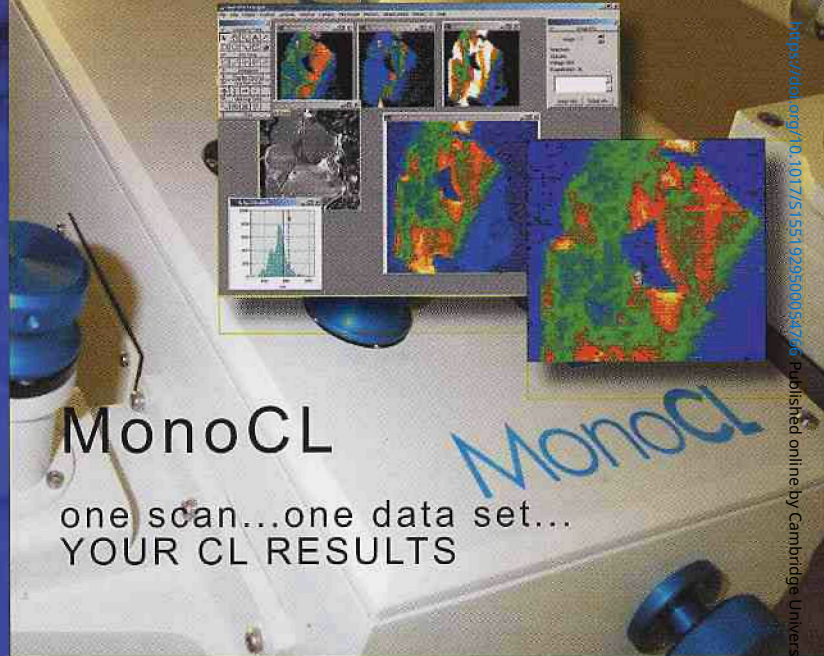


Fig9. Radial and tangential sections of *Erythrina*, showing large numbers of crystals in parenchyma cells (arrows) using circular polarized light (λ plate). Most of the crystals are prismatic in long chains (arrows), with others being smaller "crystal sand" type (arrowheads).



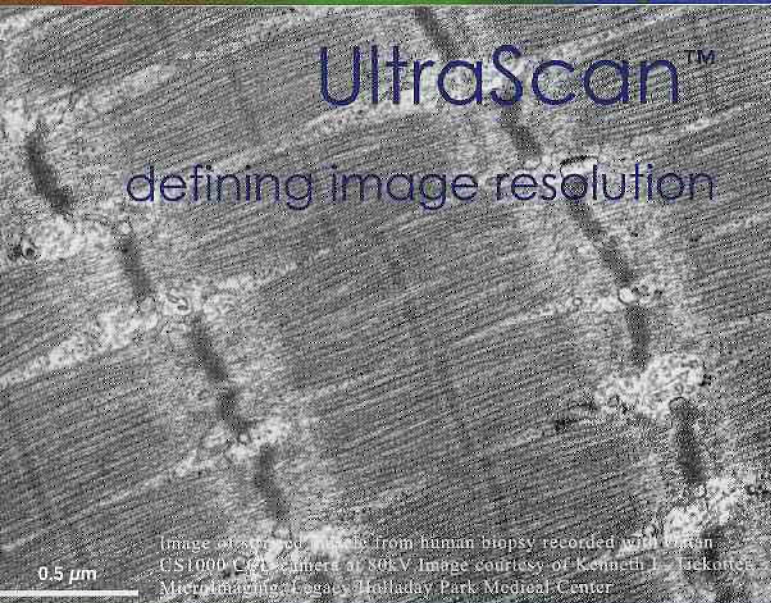
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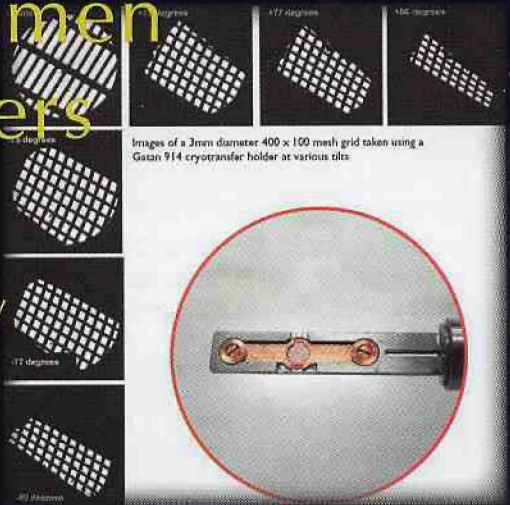
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