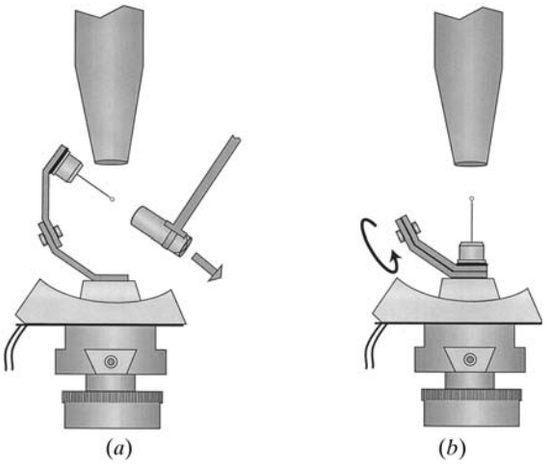

Figure 10.2.5.2
Transfer using an alternative device for achieving the correct magnetic mount orientation. (*a*) A hinged mechanism is extended to orient the magnetic mount downward, and the loop assembly is attached. (*b*) The mechanism is rotated about the hinge to place the mount in the normal orientation for data collection.

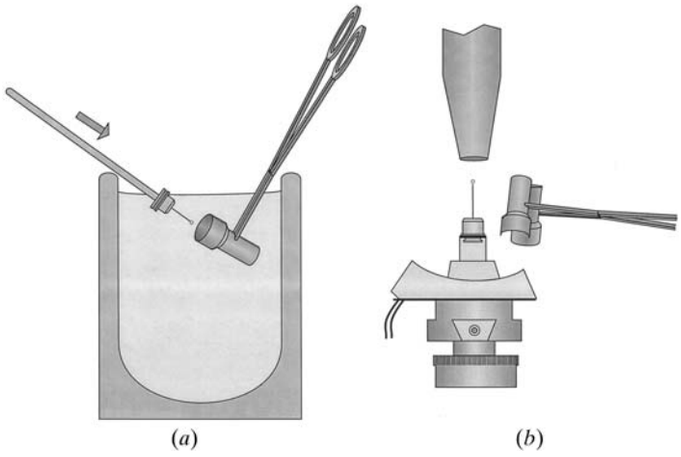

Figure 10.2.5.3
Transfer using tongs. (*a*) The crystal is inserted into a split metal cup that allows the base to be held securely. (*b*) The tongs are inverted and used to place the loop assembly on the magnetic mount. The jaws of the tongs are then opened to separate the halves of the cup, and the tongs are withdrawn.

hinge is positioned so that rotation does not translate the crystal, keeping it in the cold stream during reorientation.

When cooling in other liquid cryogens such as propane, the same cryovial transfer system is used. Flash cooling in cryovials (Fig. 10.2.4.2*c*) permits direct transfer using the magnetic mounting system. Usually, the liquid cryogen has been solidified in the vial, and it is allowed to melt at least partially before placing the crystal on the goniometer. Any remaining solid then melts and drips away (although it is often necessary to remove the last drop on the crystal with filter paper). When cooling in a larger volume of cryogen (Fig. 10.2.4.2*b*), the crystal can be 'hopped' rapidly from the cooling cryogen to the surrounding vat of liquid nitrogen. A drop of cryogen transfers with the crystal, keeping it from warming. The loop assembly can then be placed in a cryovial and transferred to the goniometer.

Another device that does not use cryovials has been introduced (Parkin & Hope, 1998) to facilitate transfer from liquid nitrogen. The device consists of a split metal cup attached to handles that allow the cup to be opened and closed. When closed, the two halves of the metal cup form a cavity that can accommodate and grasp the loop assembly. As shown in Fig. 10.2.5.3, the loop assembly is inserted after first cooling the tongs in liquid nitrogen. The thermal mass of the tongs prevents warming as the crystal is then placed on the goniometer. The tongs are opened and removed to expose the crystal to the gas stream.

Any of these transfer procedures can be reversed in order to return the loop assembly to liquid nitrogen without thawing the crystal. The assembly and cryovial can then be placed in a Dewar designed for long-term storage. Some opening should be present in the loop-assembly bases, or the cryovials should be notched, to allow free movement of liquid nitrogen. The vials are conveniently held and organized using aluminium canes, which take up to five samples and have tabs that hold the loop assemblies in place. For even more secure long-term storage, loop assemblies with threaded bases that screw into the cryovials are available.

The ability to store samples for long periods of time permits a number of crystals to be flash cooled under consistent conditions, which can be important for maintaining isomorphism, and crystals can also be stockpiled for later data collection at a synchrotron X-ray facility. In fact, crystals should be prescreened for quality in the laboratory before synchrotron data collection to make efficient use of time on the beam line. Finally, crystals that degrade in growth or harvest solutions, or that contain macromolecules in unstable or transient states, can be conveniently preserved by flash cooling and storage in liquid nitrogen.

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