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6.2.3. Summary

In the preceding sections, a brief overview has been presented of (i) the two main types of neutron sources and (ii) some of the primary components required to prepare a neutron beam for a neutron-scattering instrument. It has been assumed that as well as macromolecular crystallography, membrane and fibre diffraction, small-angle neutron scattering (see Chapter 19.4) is of interest. From a structural-biology user perspective, the advantages and disadvantages of reactor-based and spallation-source-based facilities are difficult to assess, since only very limited use of spallation sources has been documented. Direct comparisons between the performances of neutron-scattering instruments and sources are difficult, and would undoubtedly change as facilities are progressively upgraded (Carpenter & Yelon, 1986; Richter & Springer, 1998). Calculations show, however, that the use of time-of-flight techniques with partially coupled moderators on a spallation neutron source is ideal for structural-biology diffraction studies and promises to yield an effective gain of an order of magnitude in intensity (Schoenborn, 1996). When the protein crystallographic diffraction instrument now being built at LANSCE is completed in 2000, a more meaningful comparison will be possible between a premier spallation-source-based instrument and comparable reactor-based instruments.

In summary, the neutron source plays a pivotal role in the design and utility of an experiment in macromolecular crystallography, membrane and fibre diffraction, and small-angle neutron scattering. However, innovative design of the scattering instrument using the latest technology (*e.g.* image plates or large MWPCs) can partially offset certain negative impacts of the source and make an enormous difference to the instrument as a user facility. In general, neutron sources are national or regional facilities and consequently carry special requirements for user access. Therefore, a local, well equipped, medium-flux neutron source may be more suitable to test potential experiments and the premier international facility should be used only where required.

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