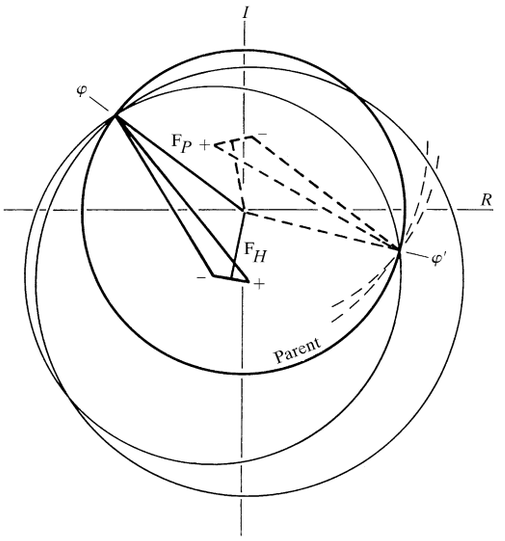

Figure 14.1.13.1
The consequences of using the incorrect hand for the heavy-atom arrangement in phase determination. The correct heavy-atom arrangement gives the construction drawn in solid lines with φ uniquely determined as the correct phase for $\mathbf{F}_P$. If the enantiomeric arrangement of heavy atoms is used, the dashed construction will result, leading to the incorrect phase φ'. Even though φ is correct and φ' is incorrect, both phase determinations have an identical figure of merit.

An alternative approach is to include anomalous-scattering data in the initial phase determination, *i.e.* to use single isomorphous replacement with anomalous scattering (SIRAS). It must be remembered that in calculating phases from anomalous-scattering data, it is first necessary to determine the coordinates of the heavy atoms *in their absolute configuration.* If the wrong hand is used in the SIRAS method (illustrated in Fig. 14.1.13.1), the resultant electron-density map will generally bear no relation to the correct electron density.

The recommended procedure, therefore, is as follows. One arbitrarily chooses one possible heavy-atom arrangement for heavy-atom derivative 1, calculates SIRAS phases and calculates a difference-electron-density map for derivative 2. The handedness of the derivative 1 coordinates are then inverted and the overall calculation repeated. The calculation based on the correct heavy-atom arrangement should show peaks at the heavy-atom sites of the second derivative. The calculation based on the incorrect arrangement shows noise (Matthews, 1966*a*). This procedure determines the absolute configuration of the heavy-atom arrangement and, at the same time, shows the derived sites for the second and subsequent derivatives.

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