Twenty Points in $\mathbf{P}^3$

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Ideals $I, J \subset k[x_0, \ldots, x_n]$ are *directly Gorenstein-linked* if there is is a Gorenstein ideal $K \subset I \cap J$ such that $K : I = J$ and $K : J = I$. The equivalence relation—Gorenstein linkage—generated by such direct linkages turns out to be very useful for the studying curves in $\mathbf{P}^3$, but its significance is still not at all clear in codimension > 2. In 2001 Hartshorne proposed the problem of determining whether the ideal of a set of 20 general points in $\mathbf{P}^3$ is Gorenstein-linked to a complete intersection. In November, Hartshorne, Schreyer and I were able to determine the graph of all direct Gorenstein linkages between general sets of points in $\mathbf{P}^3$. Computer algebra, used in a somewhat novel way, plays an essential role in the proof. I will describe the background of the theory and explain some of the ideas of the proof.