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Matroids based on graphs are much easier to work with than abstract matroids or vector matroids. But the standard graphic matroids, the cycle and cocycle matroids, are few among all matroids. Thus, it's worth having generalizations that can still be treated through graph theory, even if they are not as simple as the cycle matroid. Such matroids have been discovered several times, especially in optimization and also in coding theory, geometry, et al. Some of these matroids are: Matroids of networks with gains, and those of networks with a linear side condition. The bicircular and even-cycle matroids of a graph. The Dowling geometries of a group. The matroids of the classical root systems and of signed graphs.

All of these are matroids derived from graphs with gains. Assign a *gain*, i.e., a group element, to each oriented edge of a graph, so that reversing the edge orientation inverts the gain. This gives a *gain graph*. If the group has two elements, we have a *signed graph*. Each gain graph has two matroids, its *lift matroid*, which is an example of the general matroid lift construction, and its *frame matroid*, which is more intrinsically graphic. I will survey the properties and uses of these matroids as far as I know them. (Received February 04, 2008)