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A closed Riemann surface X which can be realized as a 3-sheeted covering of the Riemann sphere is called trigonal, and such a covering will be called a trigonal morphism. If the trigonal morphism is a cyclic regular covering, the Riemann surface is called real cyclic trigonal Riemann surface. Accola showed that the trigonal morphism is unique for Riemann surfaces of genus greater or equal to 5. We characterize real trigonality by means of Fuchsian and NEC groups. We use this to calculate Riemann surfaces of low genus with non-unique trigonal morphisms. (Received February 10, 2005)