

# My favorite cap in $\text{PG}(5, 3)$

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The Veronese surface  $\mathcal{V}$  in  $\text{PG}(5, 3)$  is a cap with thirteen points, and it contains thirteen planar quadrangles (conics). If one planar quadrangle of  $\mathcal{V}$  is replaced with its diagonal triangle, then one obtains another cap, say  $\mathcal{K}$ , with twelve points: nine points from  $\mathcal{V}$  and three points off  $\mathcal{V}$ . Such a cap is a point model of the small Witt design  $W_{12}$ , the blocks being those hyperplane sections of  $\mathcal{K}$  which contain more than three (actually six) points of  $\mathcal{K}$ . Our construction yields an alternative approach to results which were obtained independently by H.S.M. Coxeter (1958) and G. Pellegrino (1973). In fact, there are various easy ways to obtain a cap, which is projectively equivalent to  $\mathcal{K}$ , by replacing certain points of the Veronese surface  $\mathcal{V}$  with other points of its ambient space.