# Explicit images of the Shimura Correspondence

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For $(r, 6) = 1$ with $1 \leq r \leq 23$, and a non-negative integer $s$, we define

$$
\mathcal{A}_{r,s, N, \chi} = \{ \eta(z)^{r} f(z) : f(z) \in M_{s}(N, \chi)\}.
$$

In 2014, Yang showed that for $F \in \mathcal{A}_{r, s, 1, 1_N}$, we have $\textup{Sh}_{r}(F \mid V_{24}) = G \otimes \chi_{12}$ where $G\in S^{new}_{r+2s - 1}(\Gamma_{0}(6), - \left( \frac{8}{r} \right), - \left( \frac{12}{r} \right))$, where $\textup{Sh}_{r}$ is the $r$-th Shimura lift associated to the theta-multiplier. He proved a similar result for $(r,6) = 3$.\:His proofs rely on trace computations in integral and half-integral weights.

In this paper, we provide a constructive proof of Yang's result. We obtain explicit formulas for $\mathcal{S}_{r}(F)$, the $r$-th Shimura lift associated to the eta-multiplier defined by Ahlgren, Andersen, and Dicks, when $1\leq r\leq 23$ is odd and $N = 1$. We also obtain formulas for lifts of Hecke eigenforms multiplied by theta-function eta-quotients and lifts of Rankin-Cohen brackets of Hecke eigenforms with theta-function eta-quotients..