





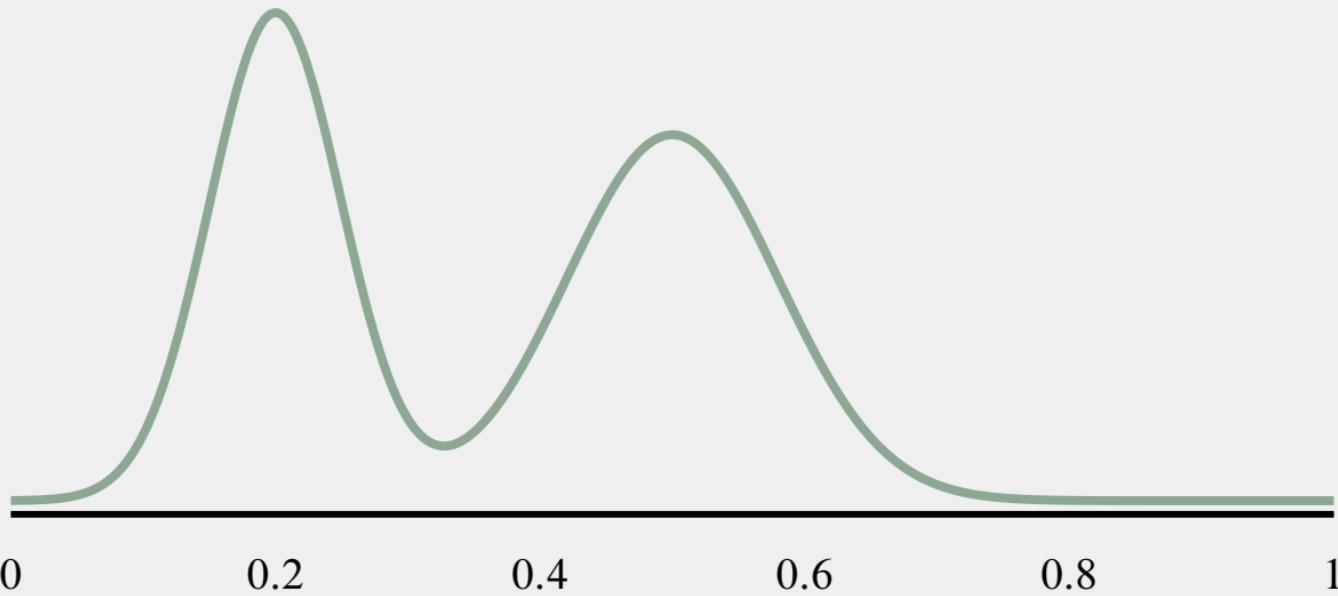
*Physical conjugate(?) priors*





# GAUSSIAN MIXTURE

$$p(\psi \mid \Theta) = \sum_{i=1}^k w_i \mathcal{N}(\psi \mid \mu_i, \sigma_i^2)$$





$\mathcal{N} \Gamma^{-1}$  is a conjugate prior for  
 $\mathcal{N}$  with unknown mean and  
variance.

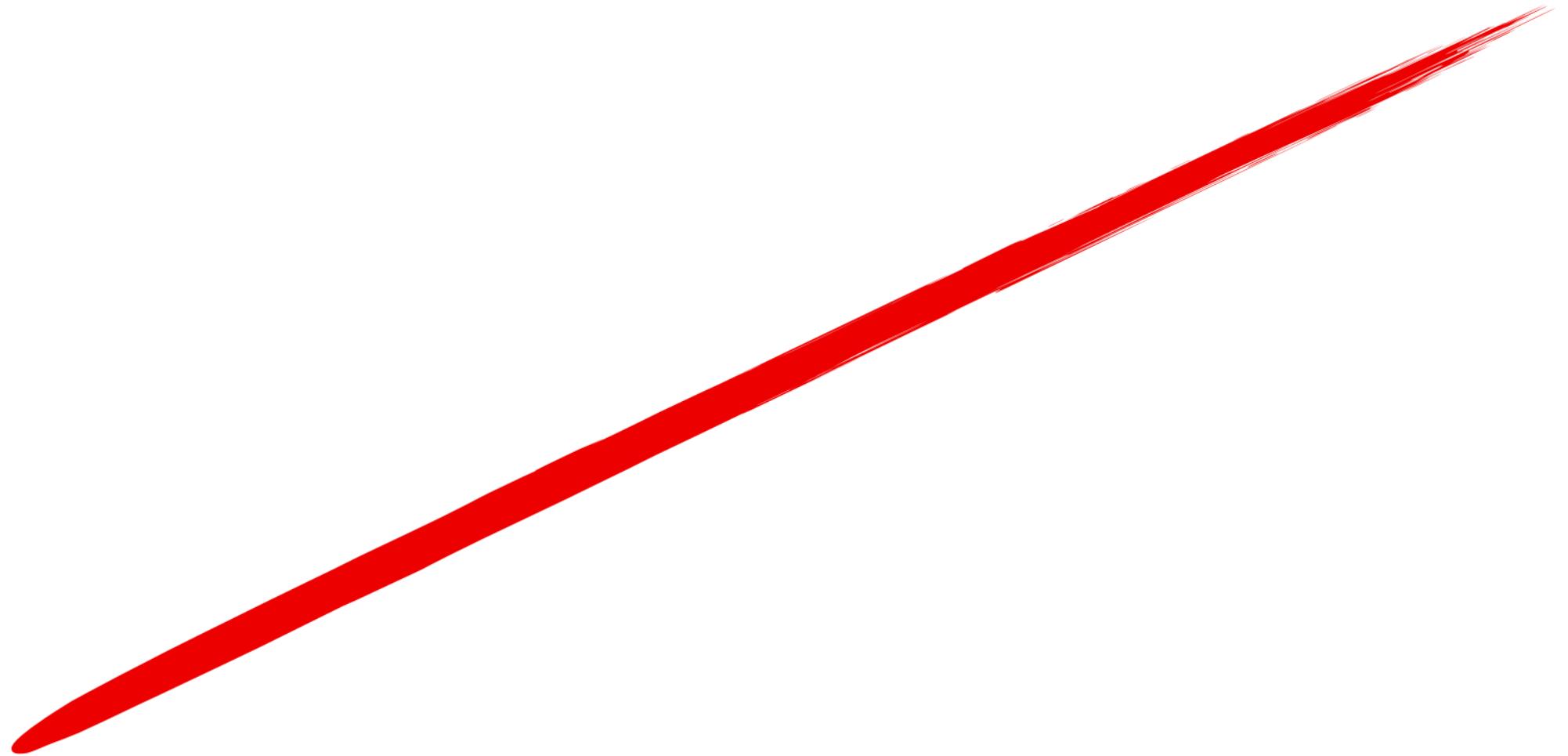
ДОКУМЕНТАЦИЯ  
ПО ОРГАНИЗАЦИИ

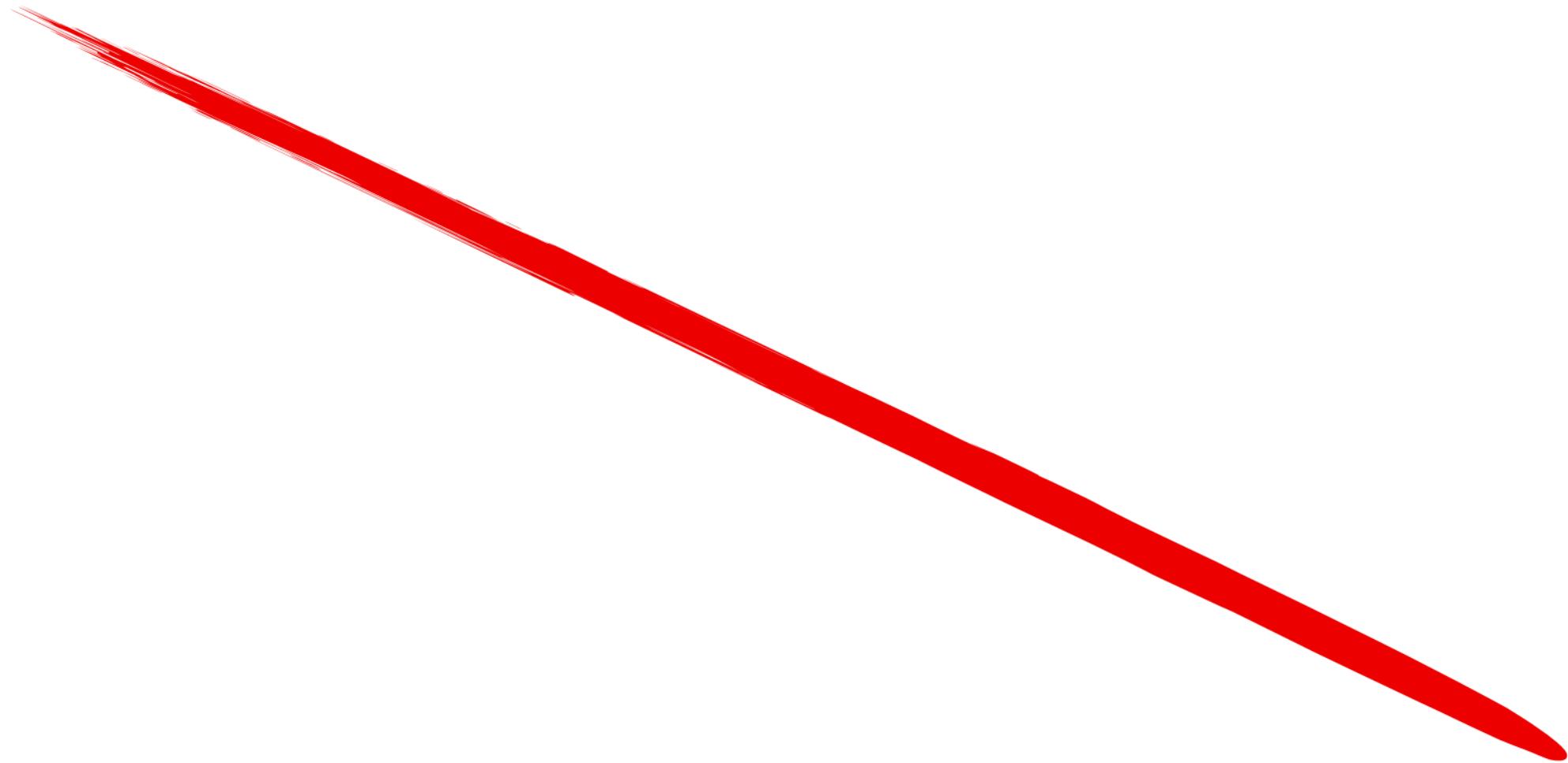
$$p(\Theta \mid \Psi) = \mathrm{Dir}(w \mid a).$$

$$\prod_{i=1}^k\mathcal{N}\Gamma^{-1}\left(\mu_i,\sigma_i^2\mid\tau_i,\kappa_i,\beta_i,\gamma_i\right)$$

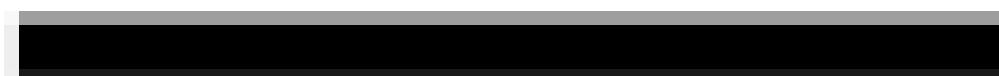
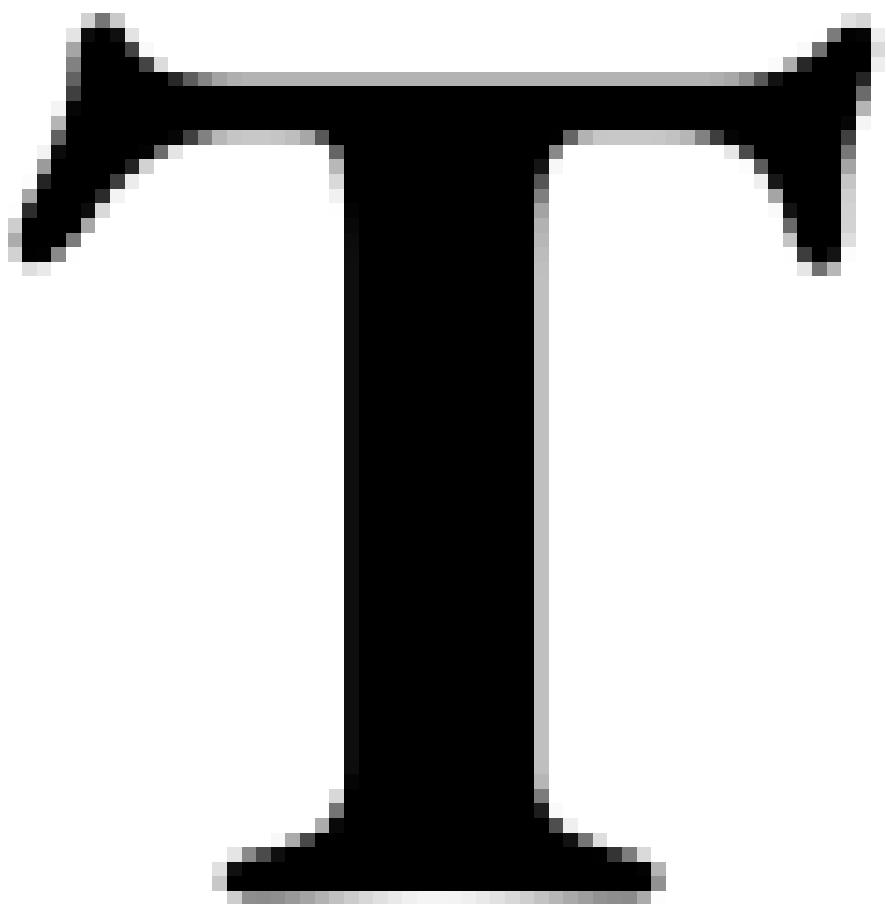
# POSTERIOR (???)

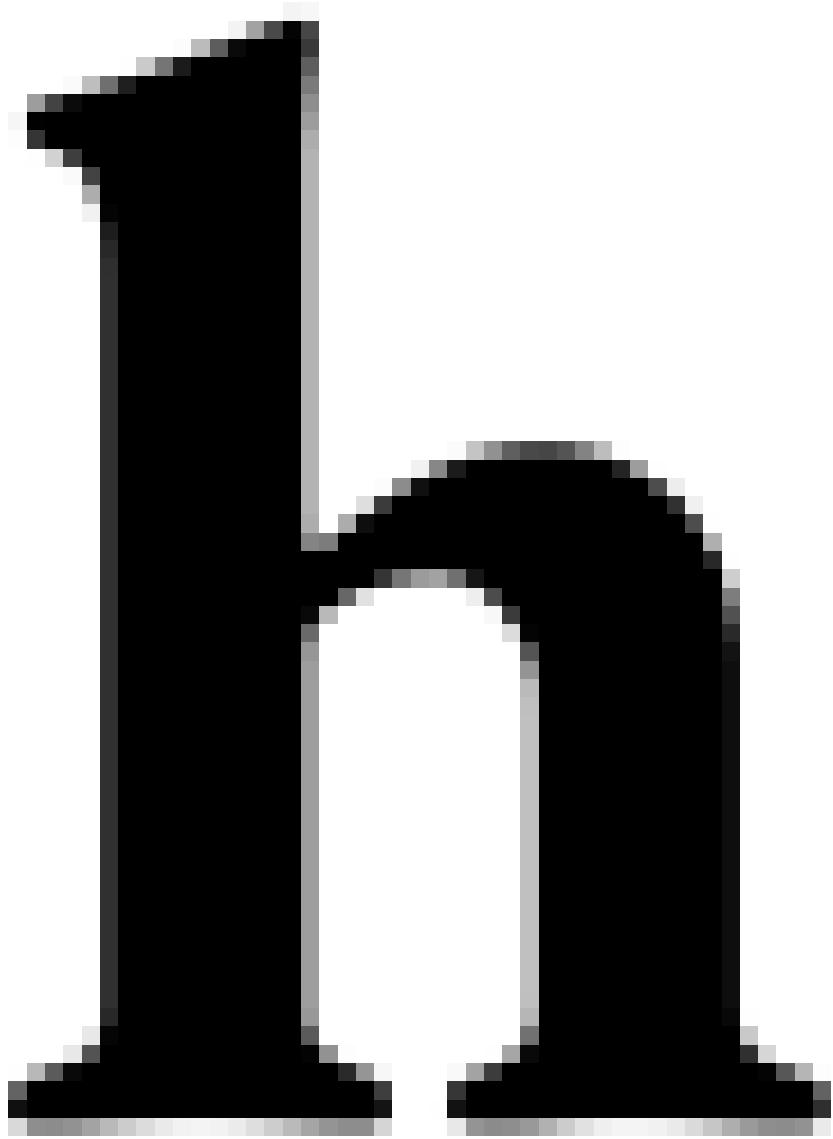
$$p(\Theta \mid \psi, \Psi) = \frac{1}{M} \left[ \sum_{j=1}^k c_j \operatorname{Dir}(\boldsymbol{w} \mid \tilde{\boldsymbol{a}}_j) \cdot \mathcal{N}\Gamma^{-1} \left( \mu_j, \sigma_j^2 \mid \tilde{\tau}_j, \tilde{\kappa}_j, \tilde{\beta}_j, \tilde{\gamma}_j \right) \cdot \prod_{\substack{i=1 \\ i \neq j}}^k \mathcal{N}\Gamma^{-1} \left( \mu_i, \sigma_i^2 \mid \tau_i, \kappa_i, \beta_i, \gamma_i \right) \right]$$

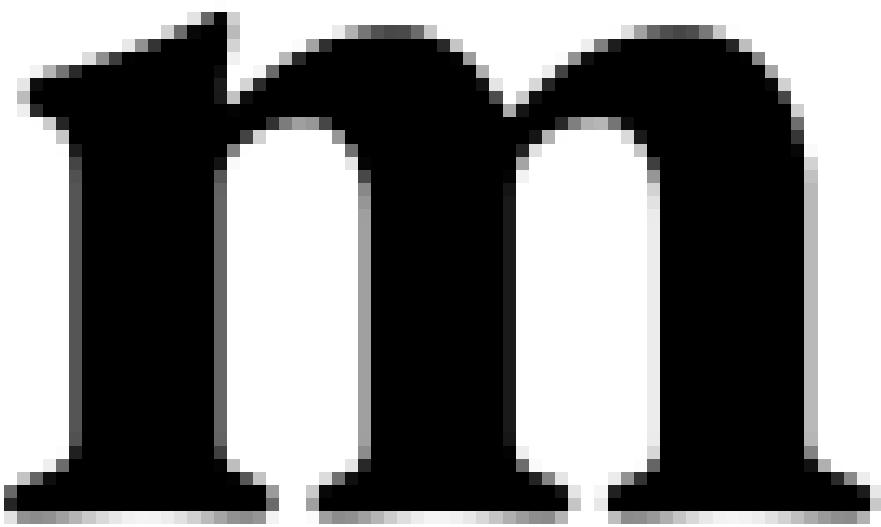




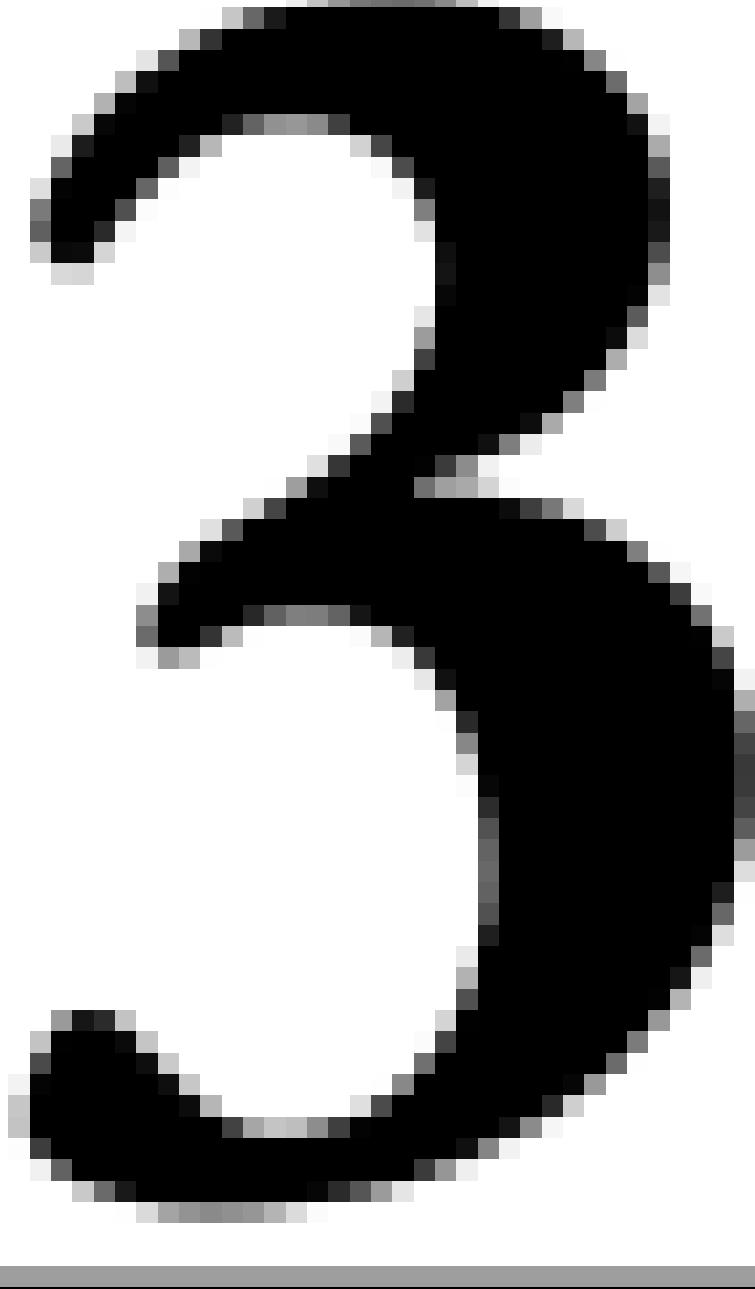


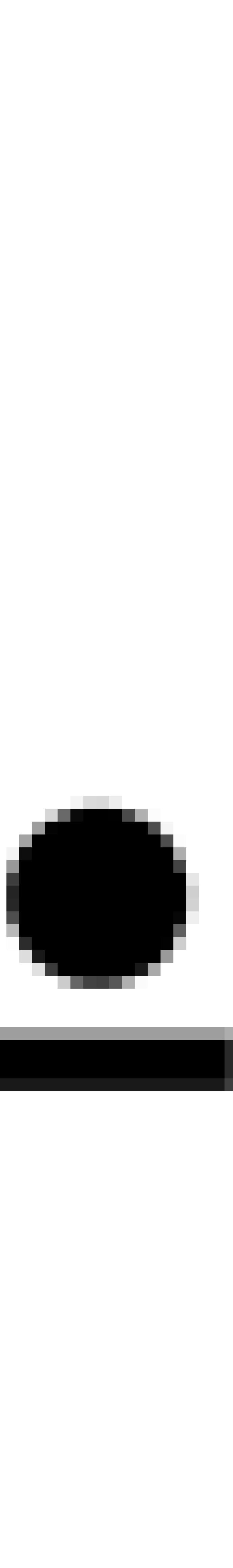


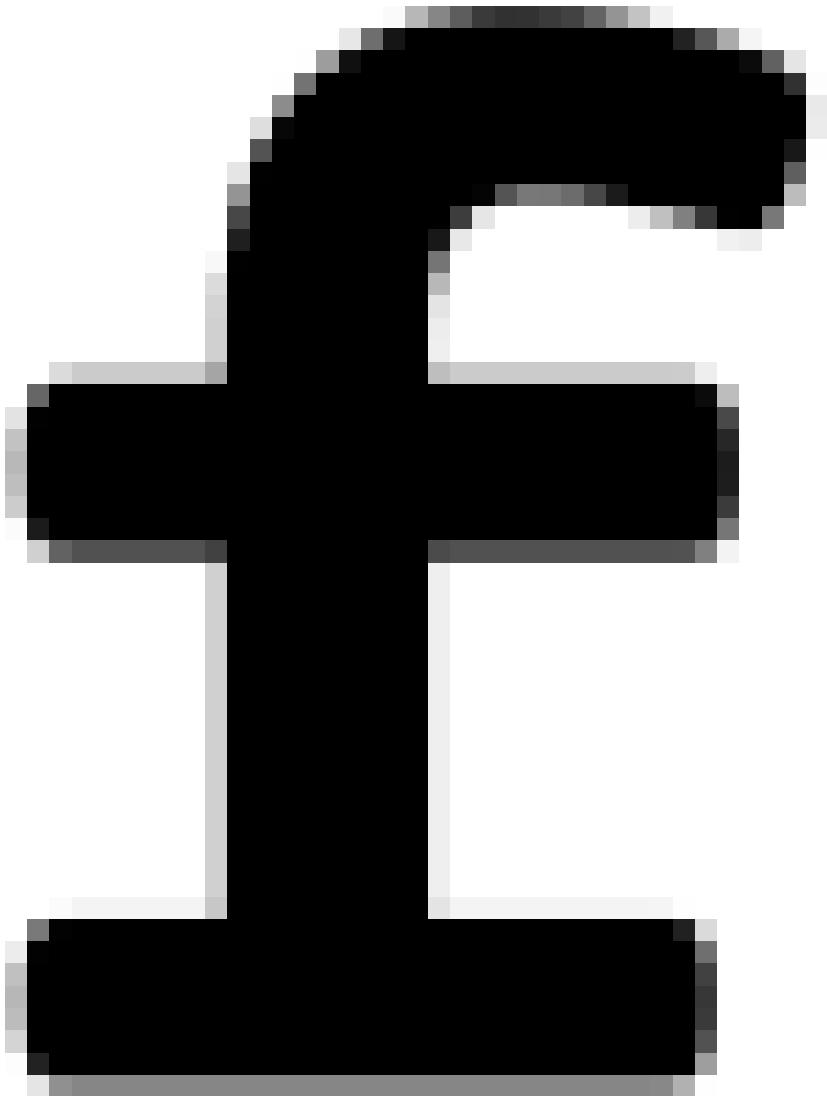


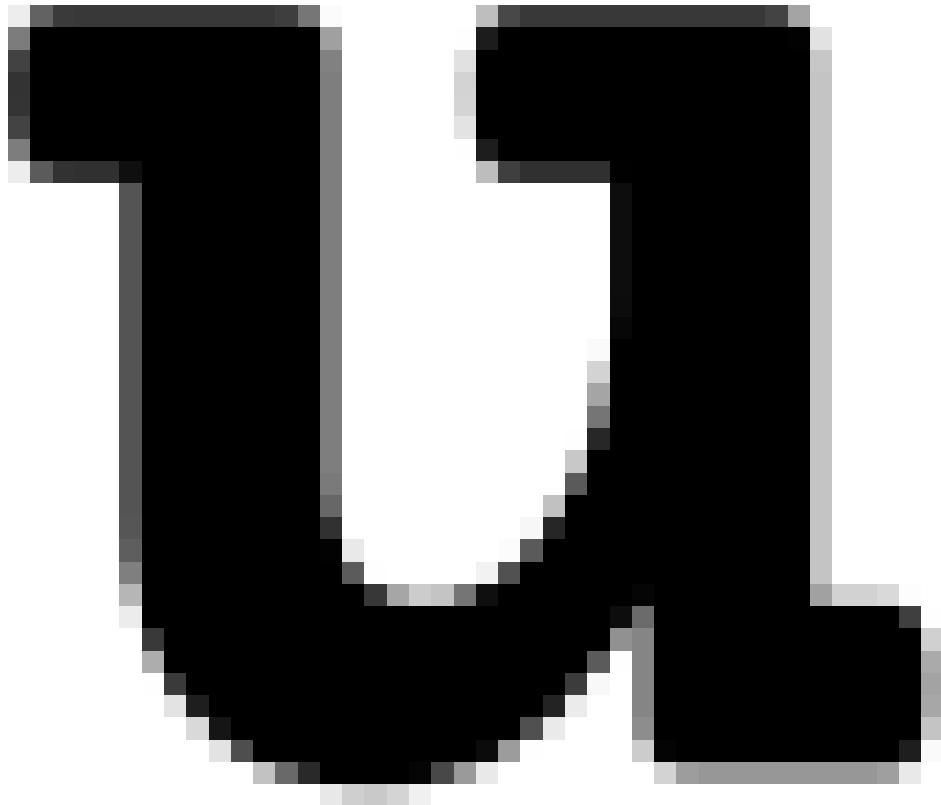


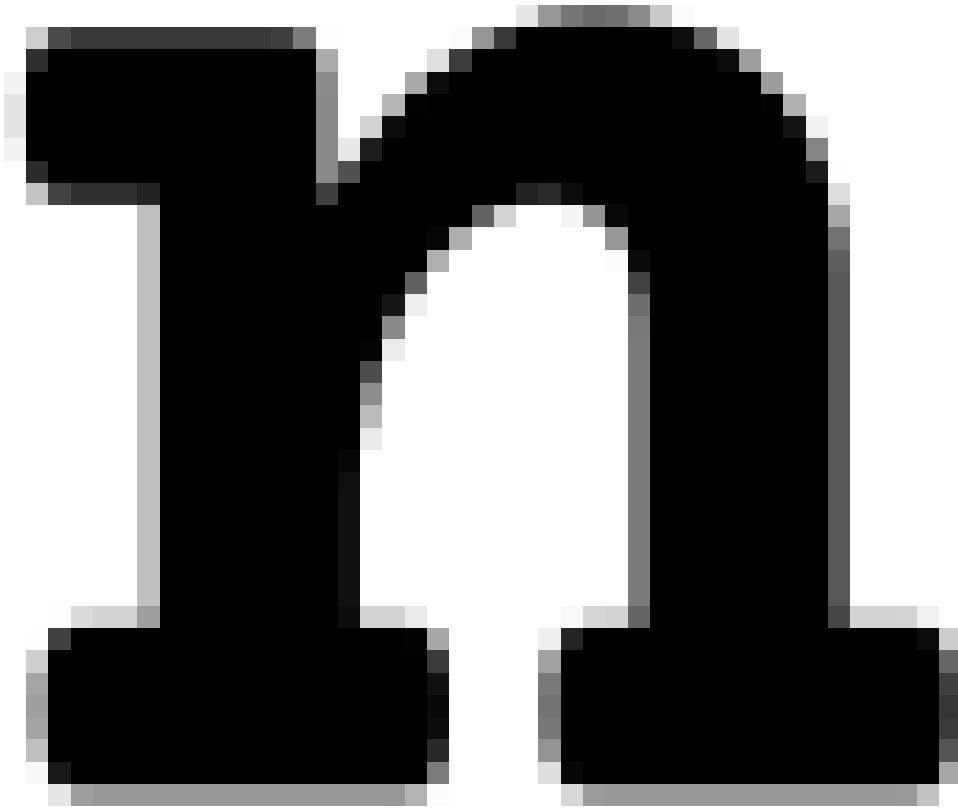


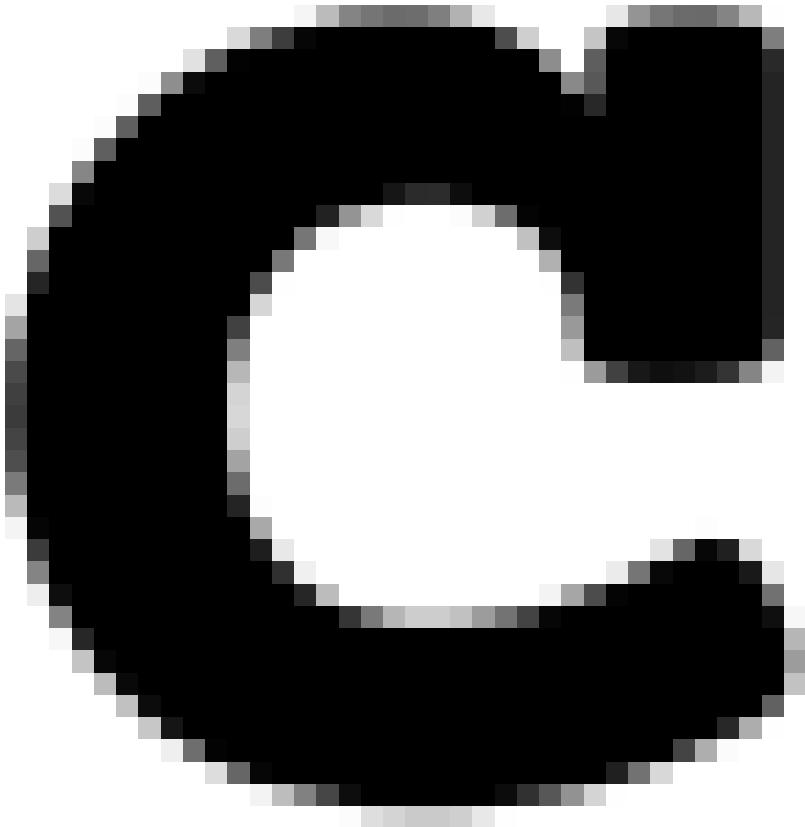


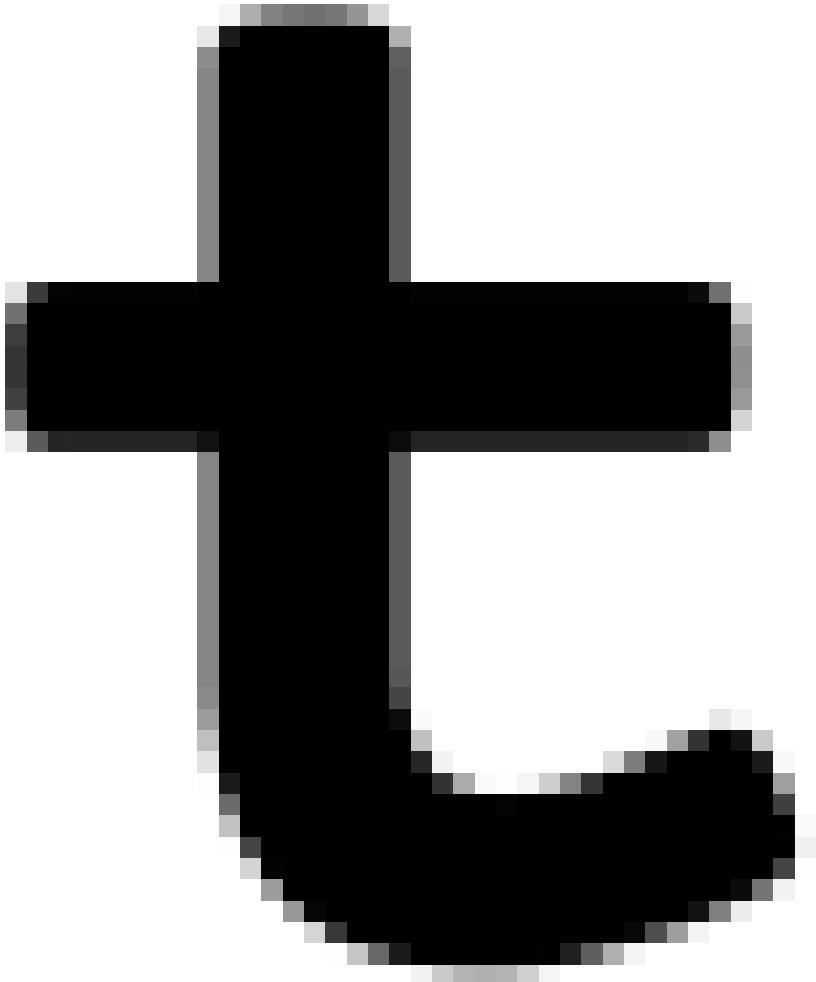


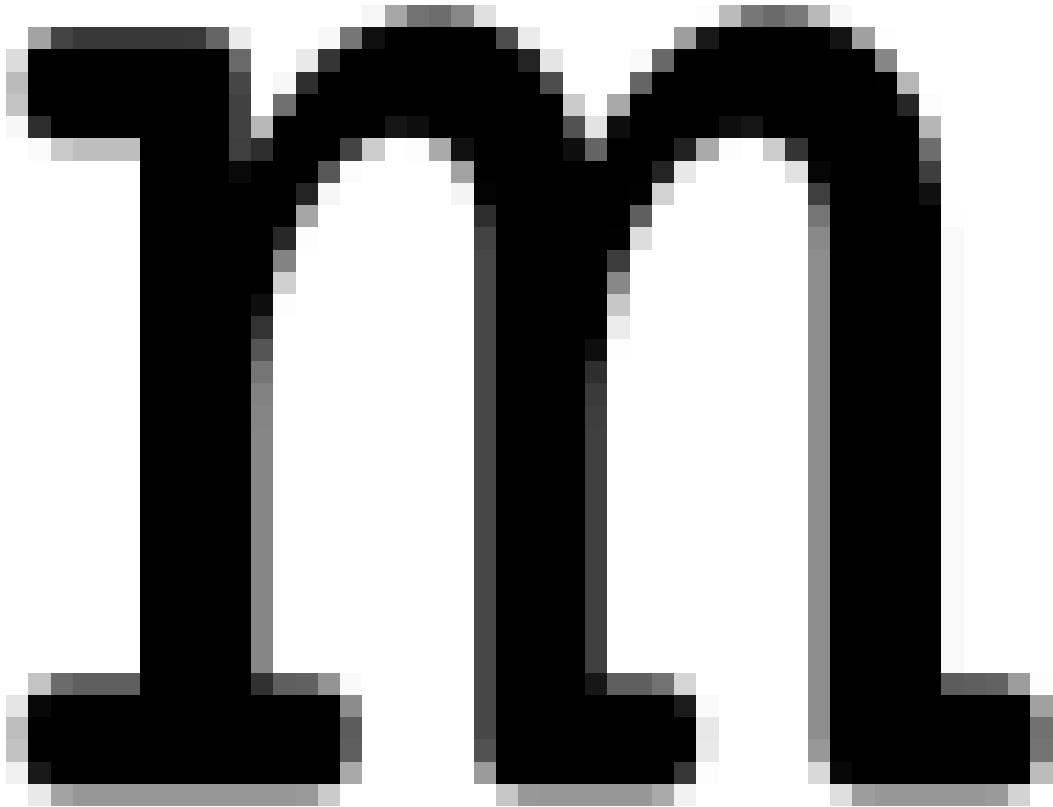


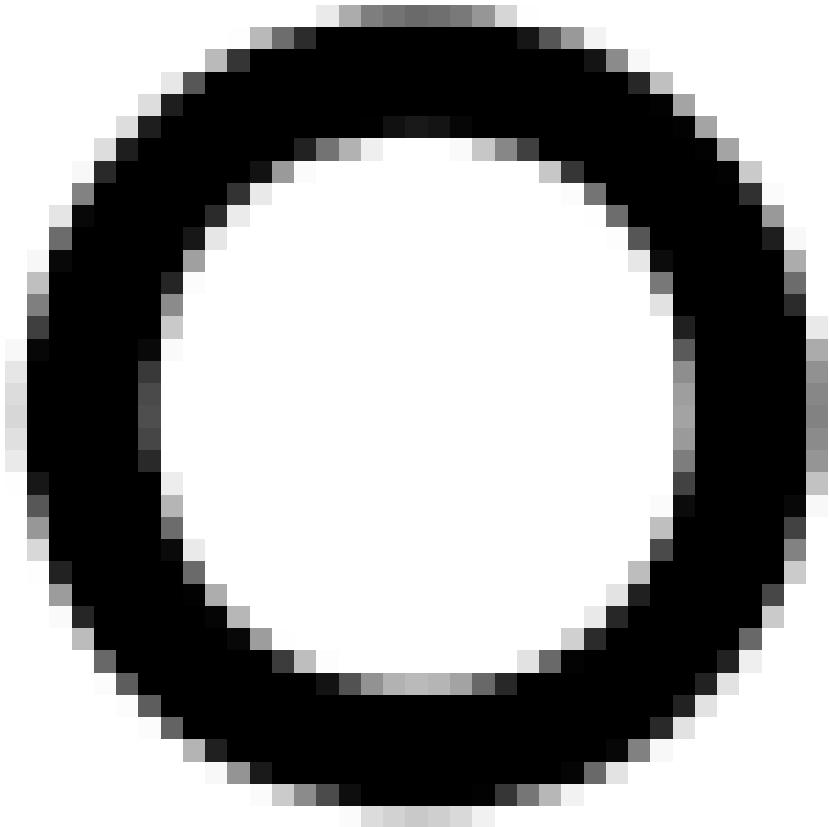


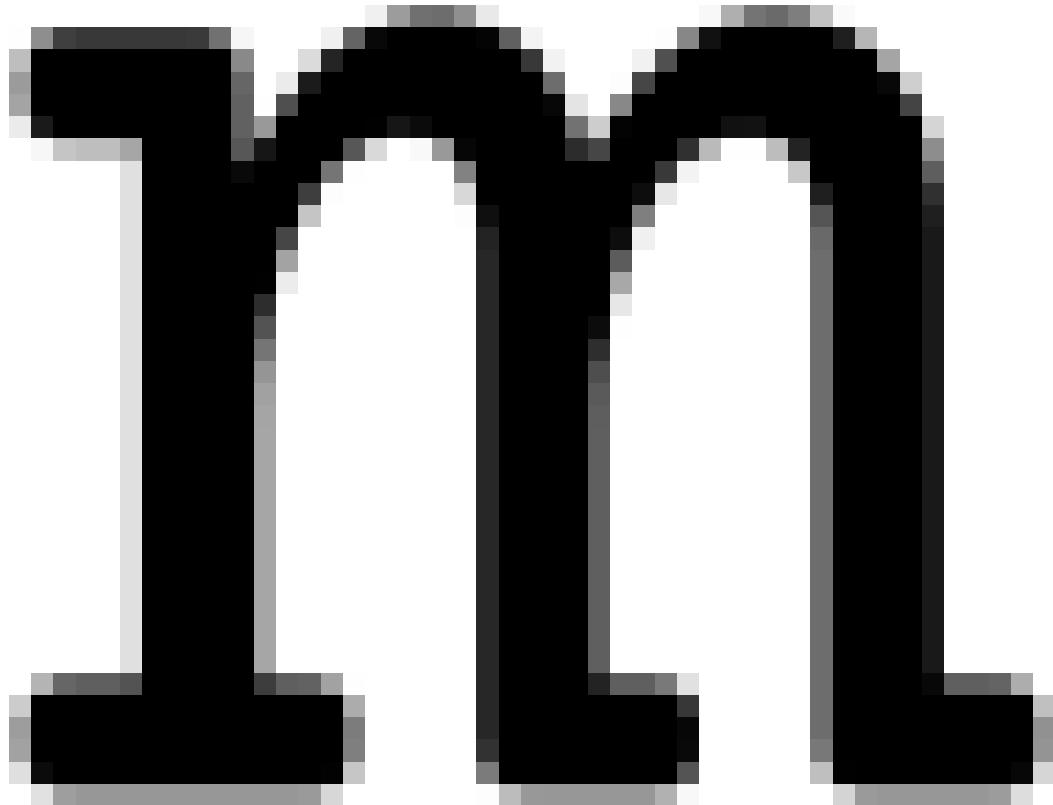


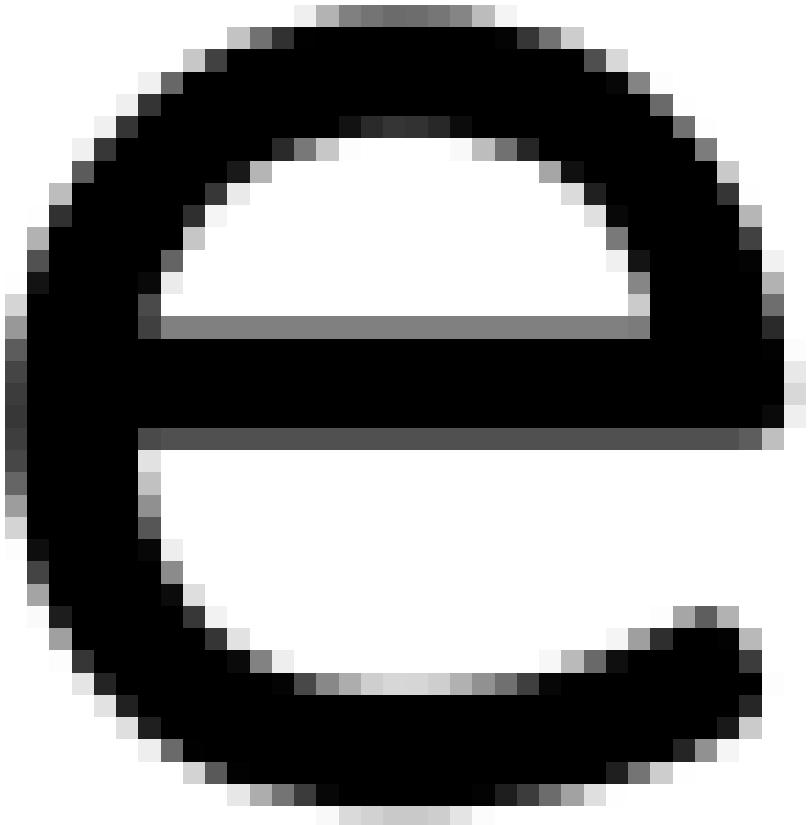


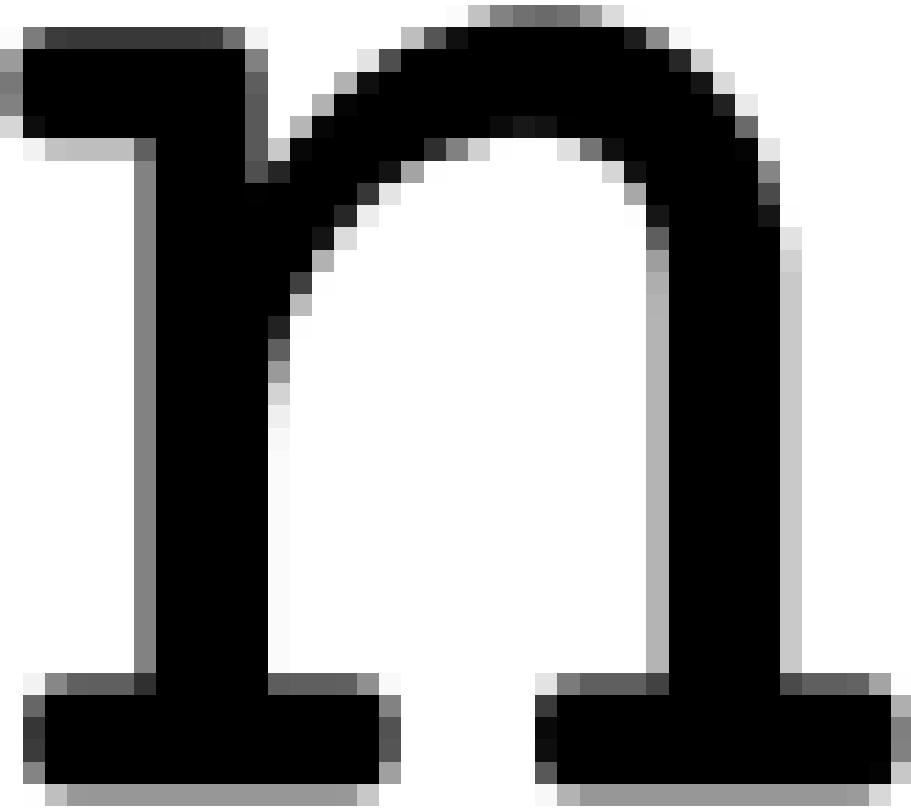


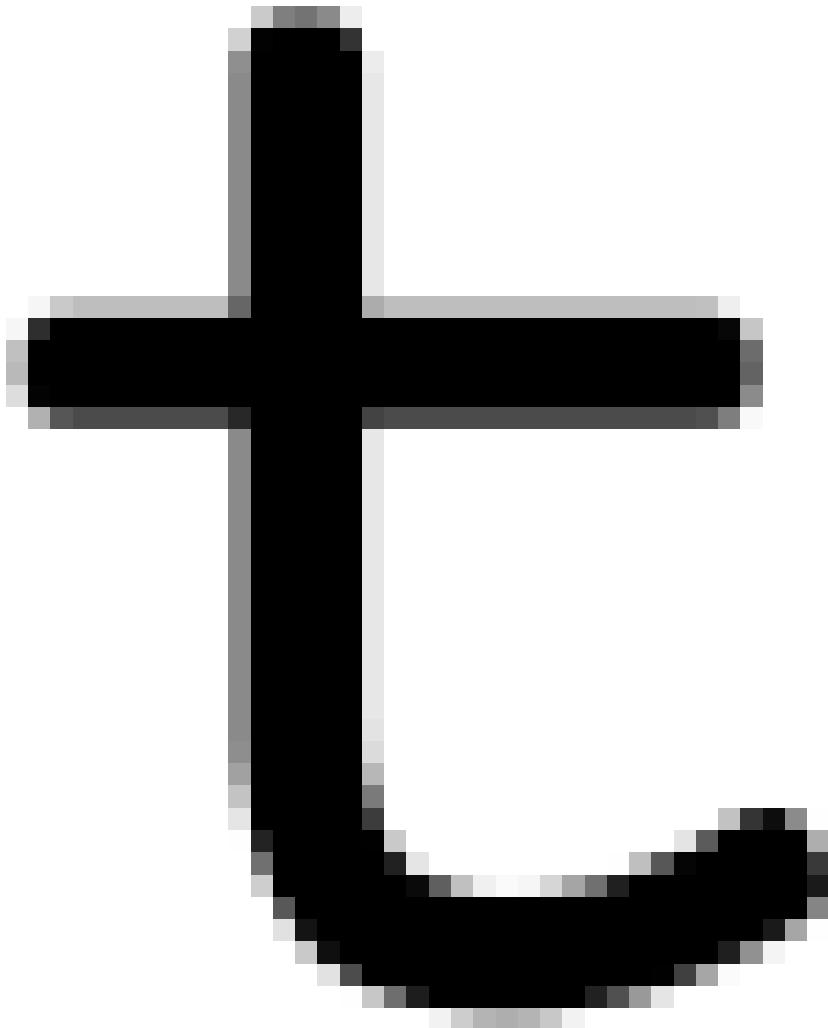


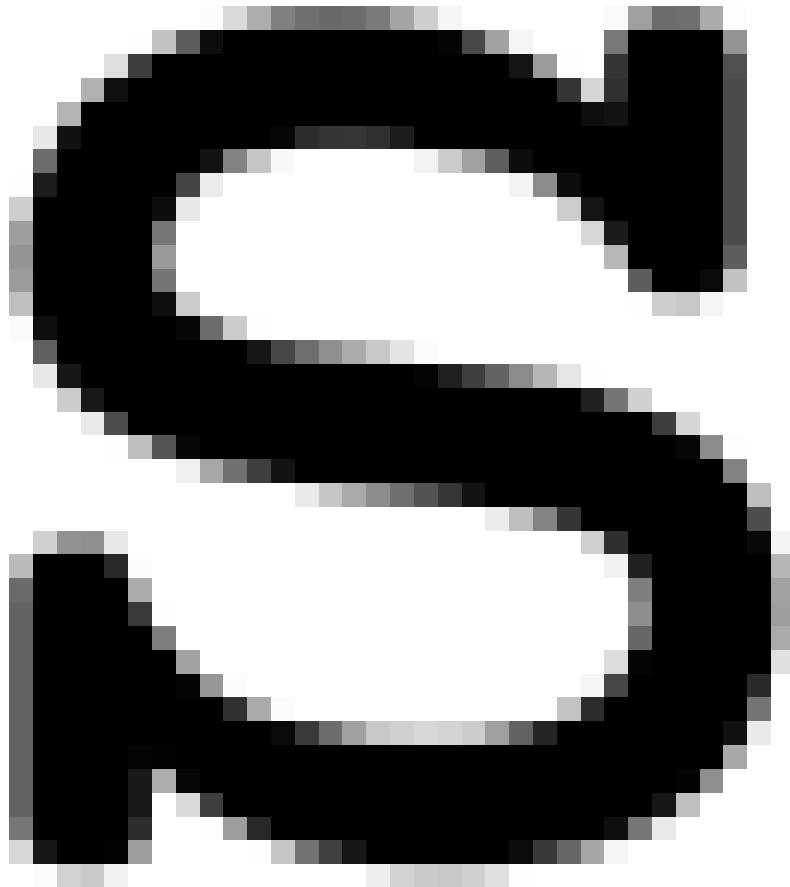


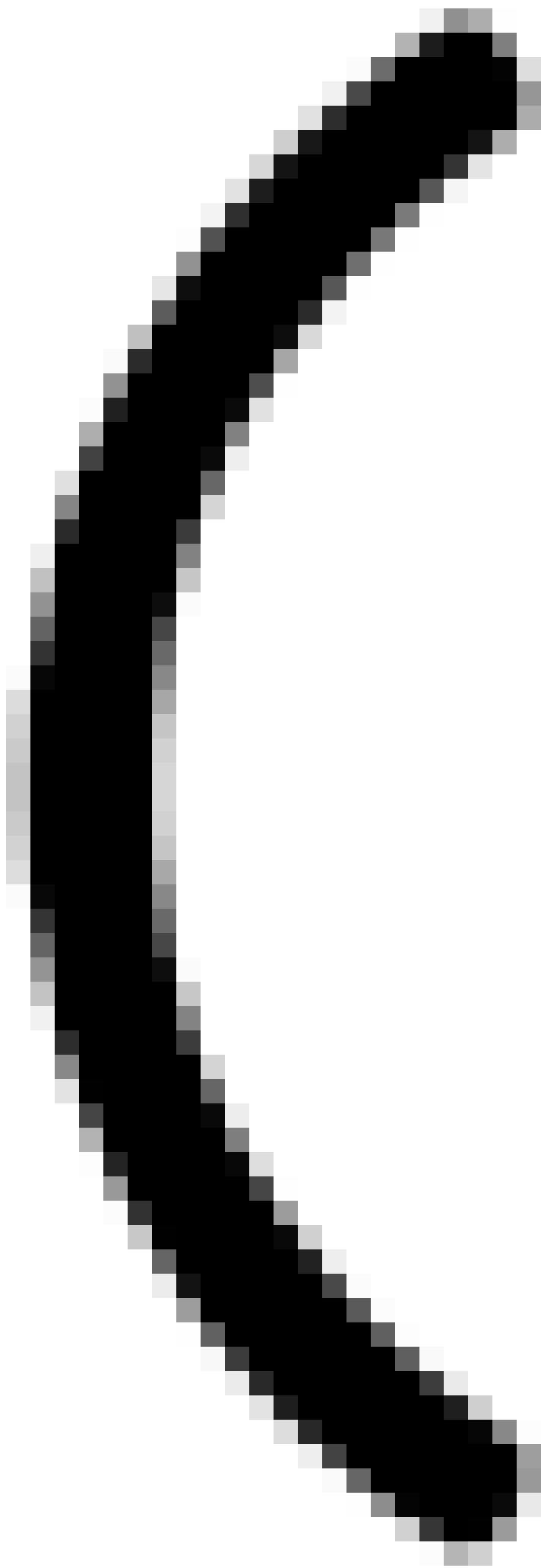


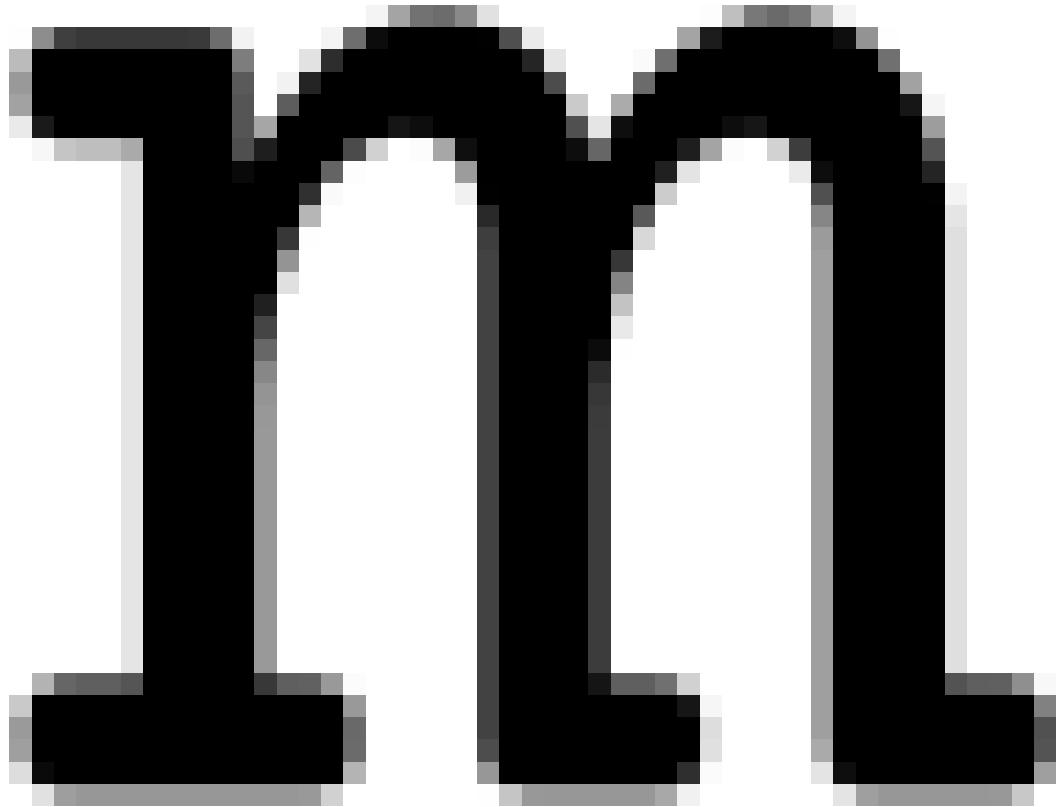


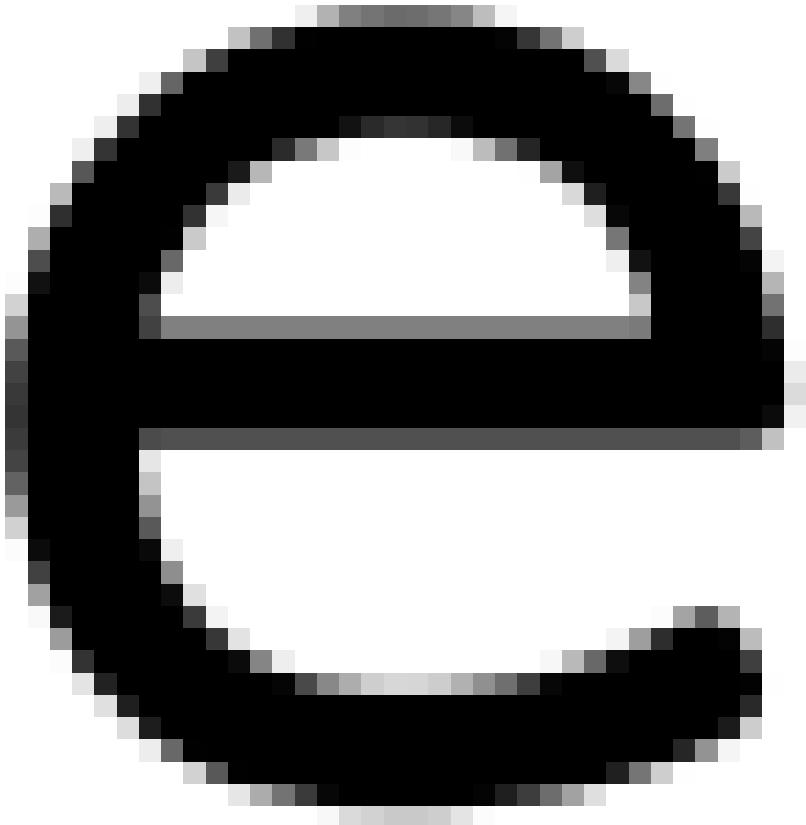




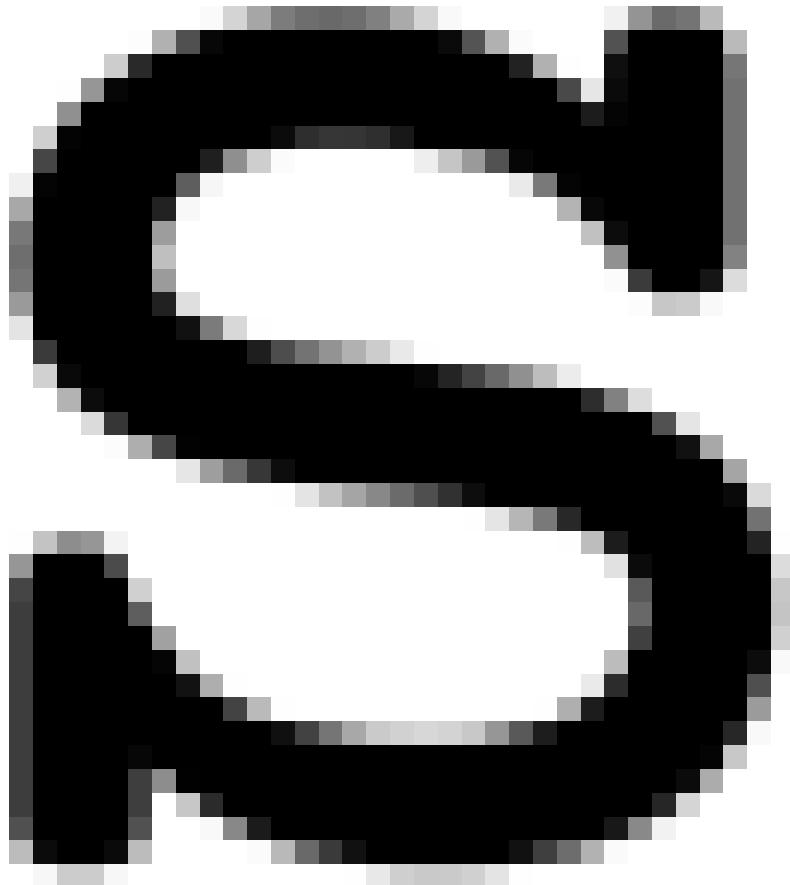




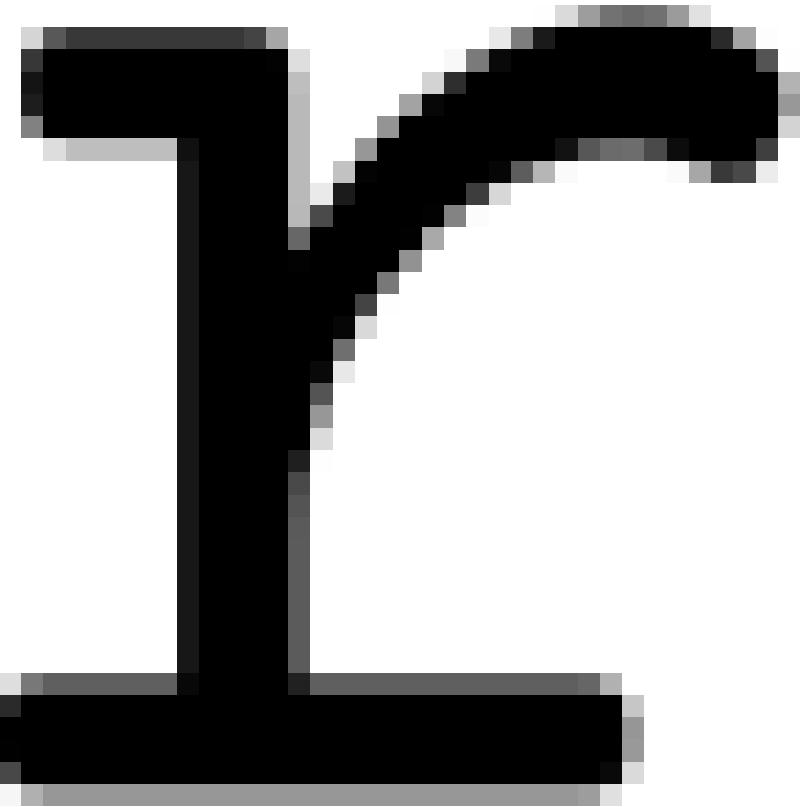


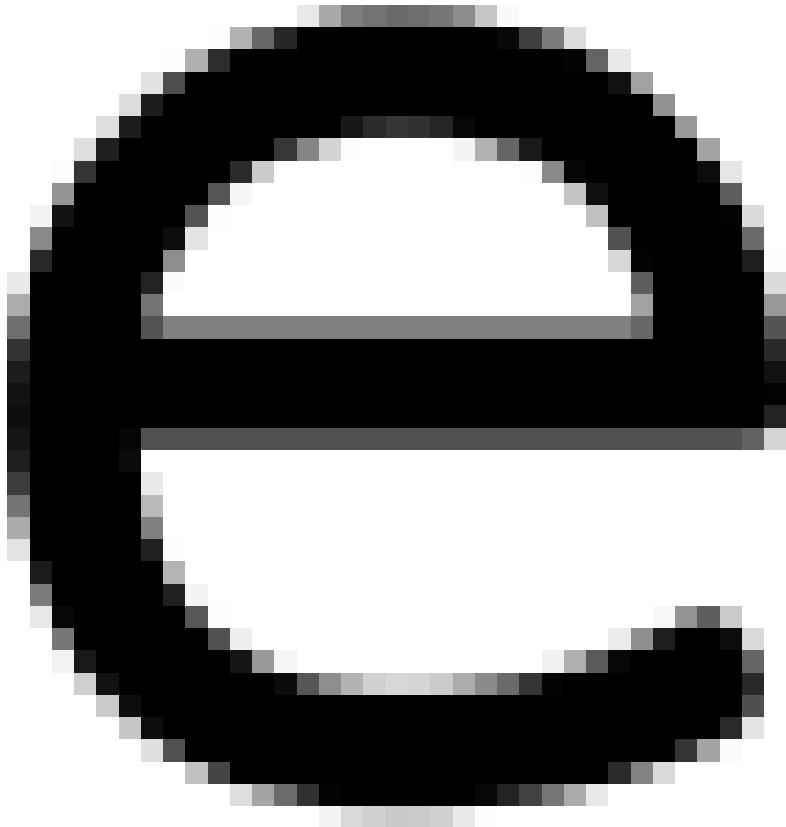


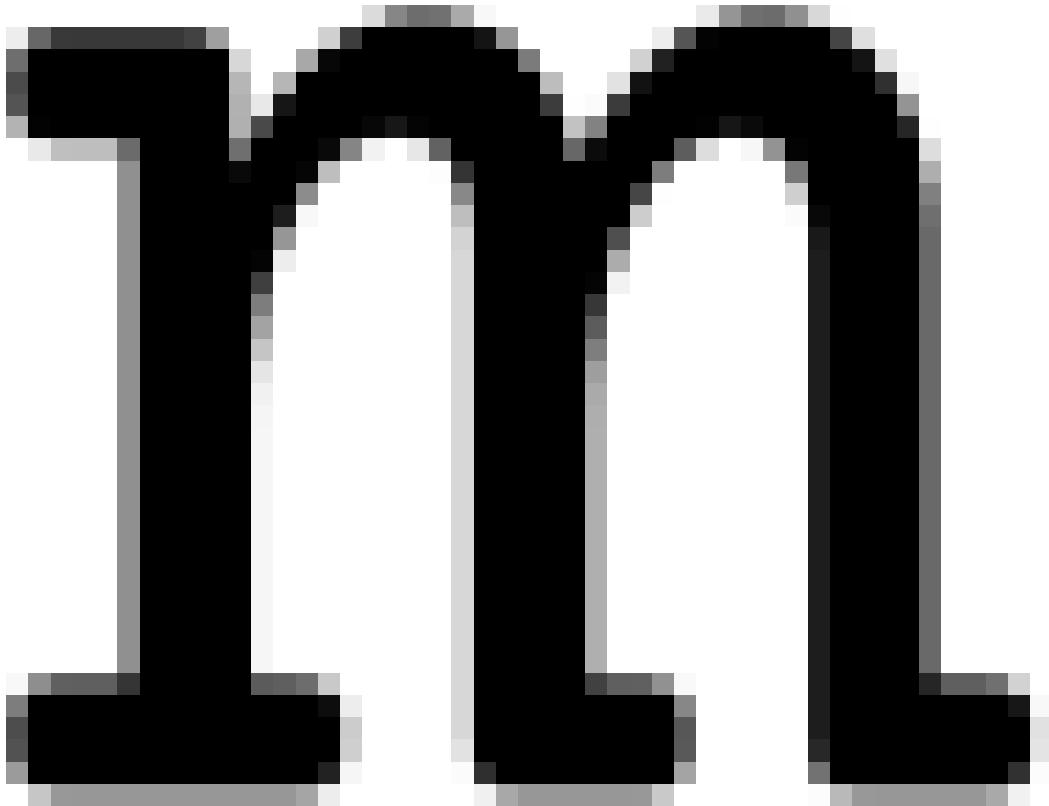


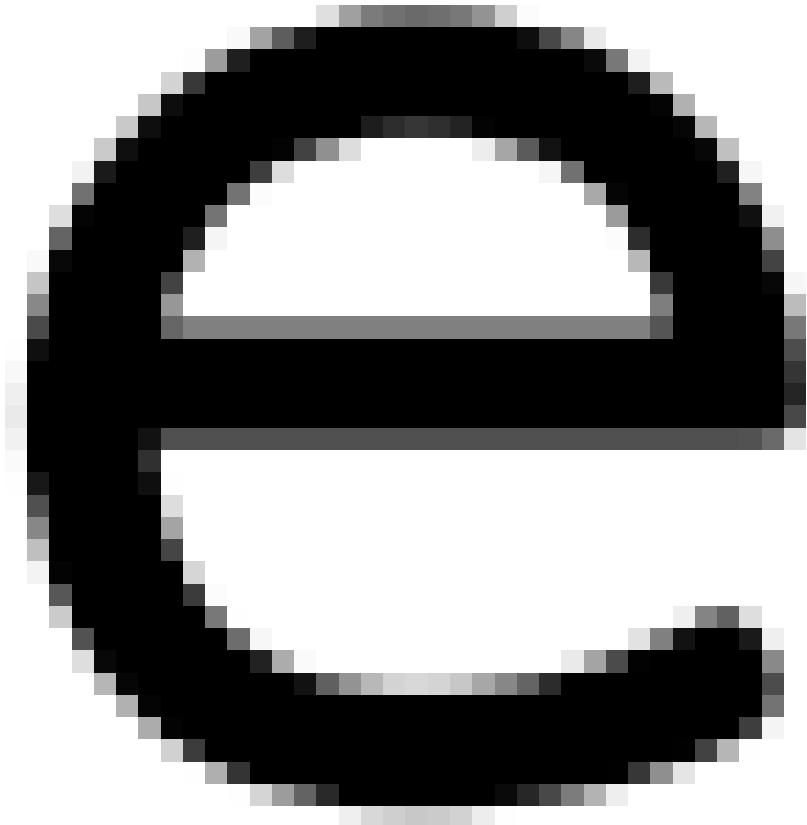


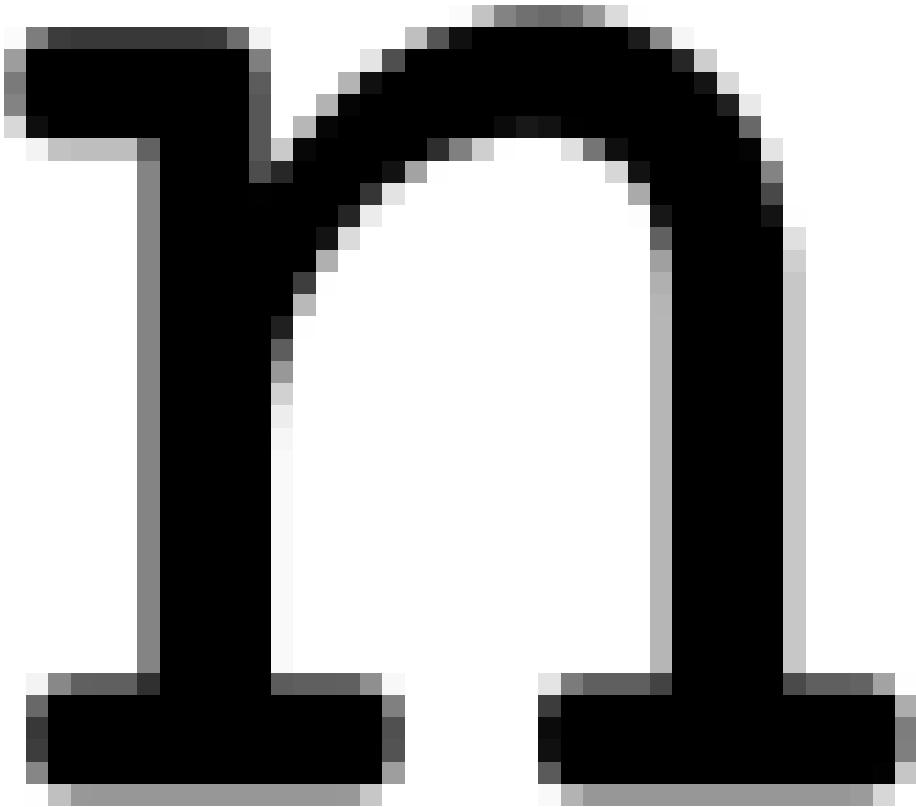


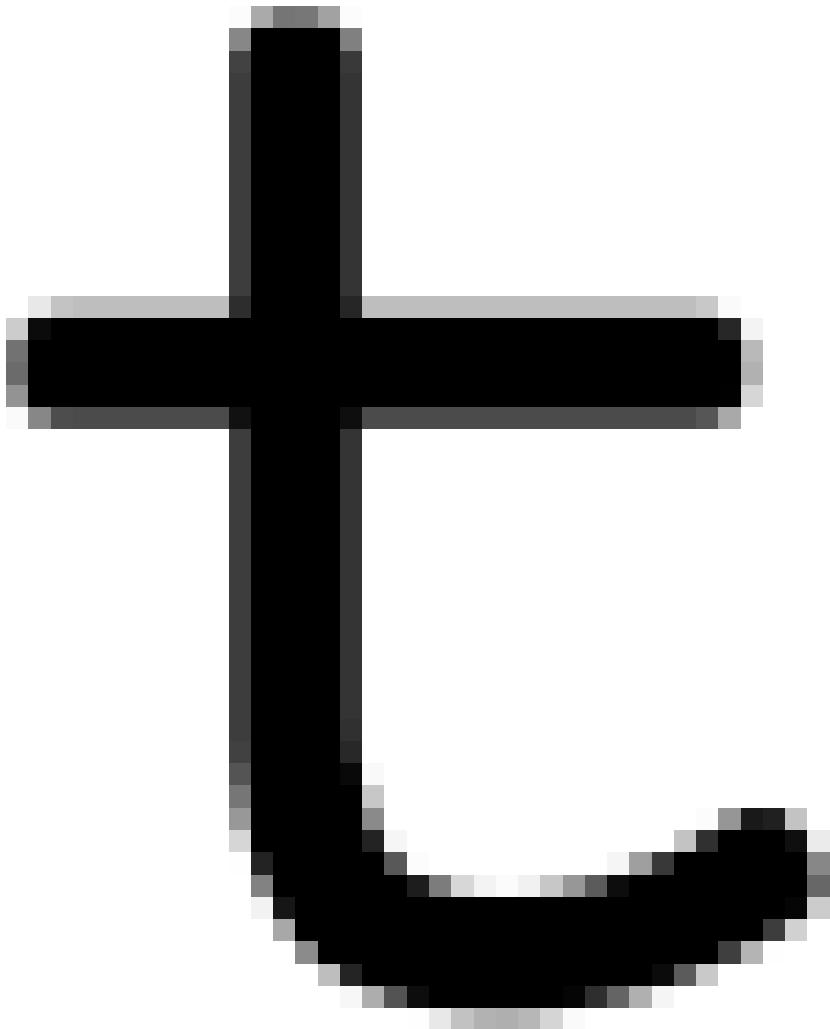


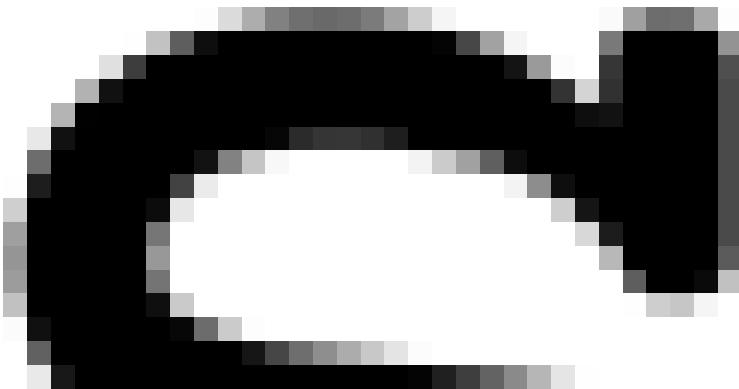


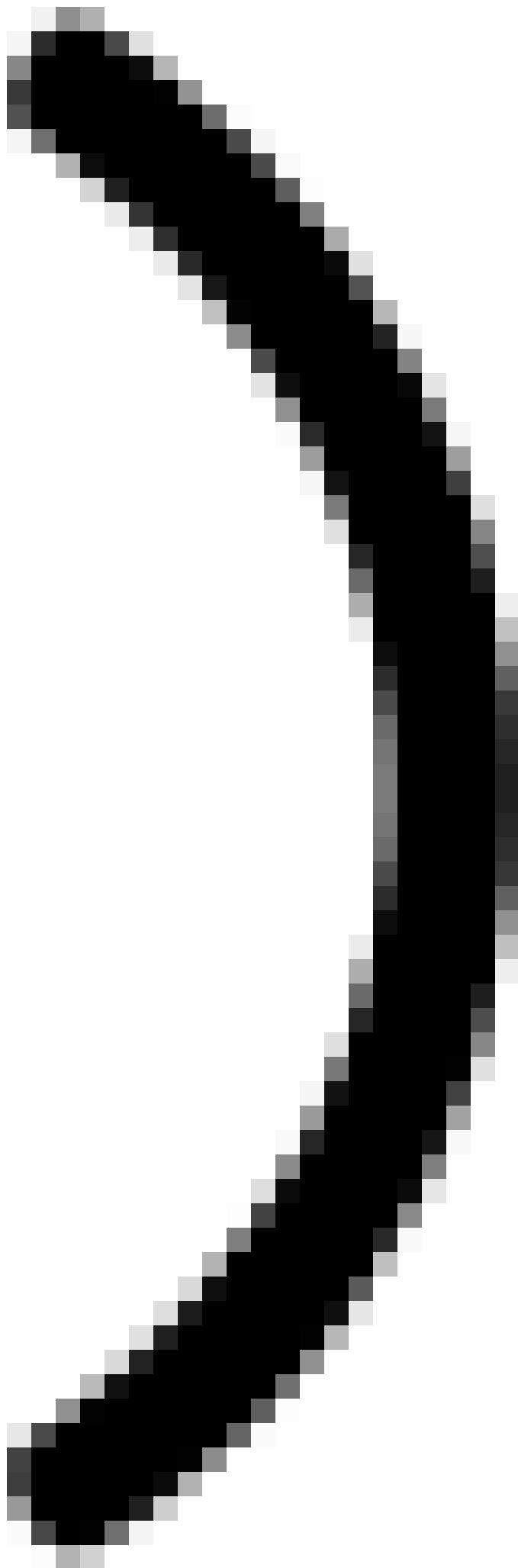


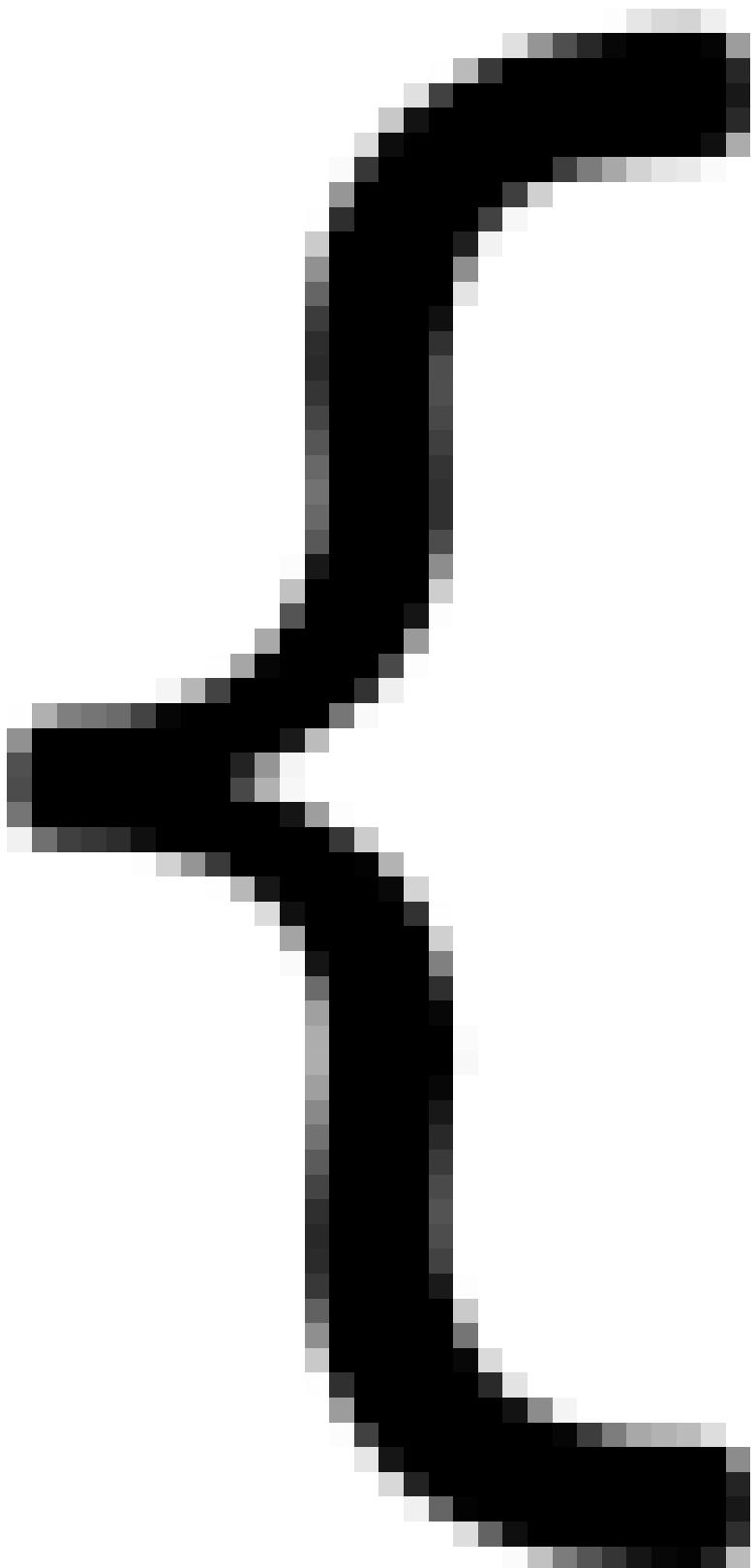






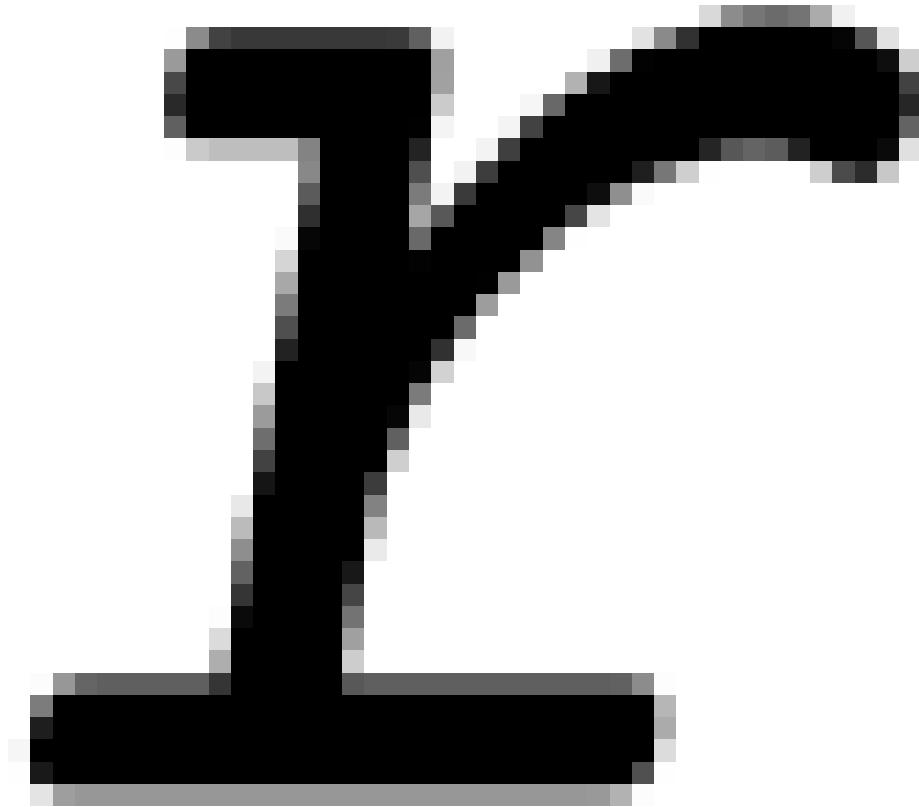








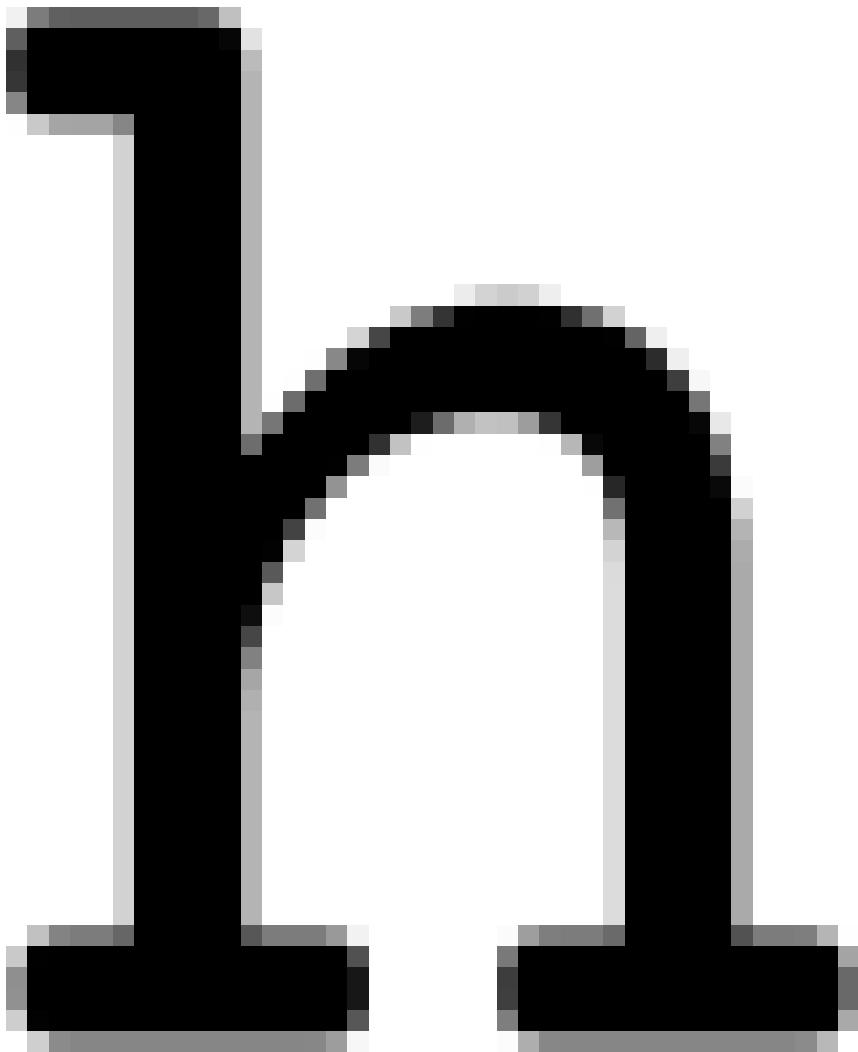


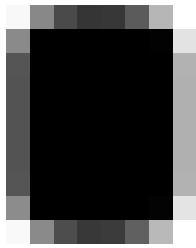




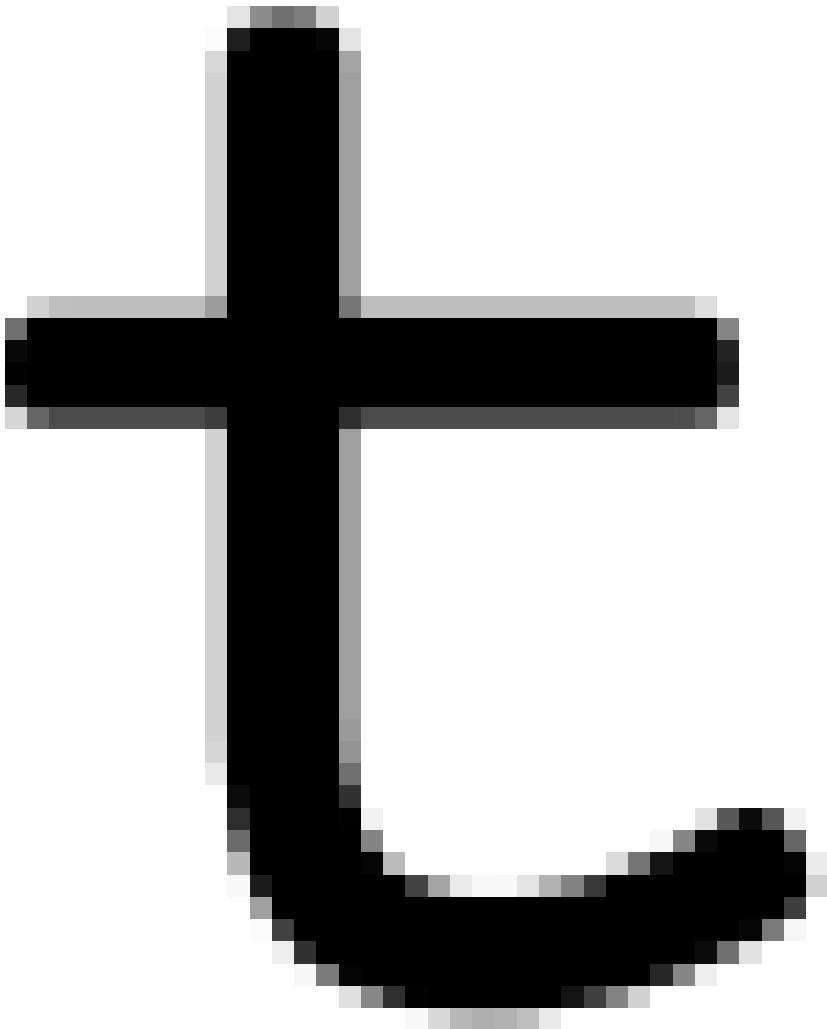




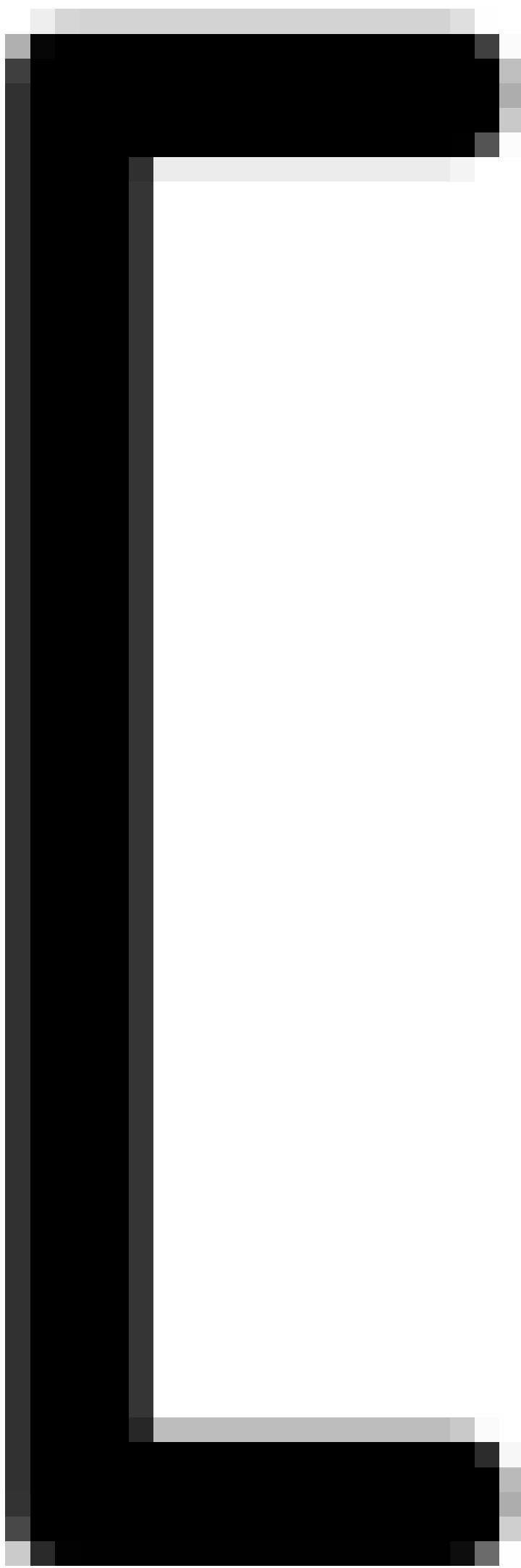




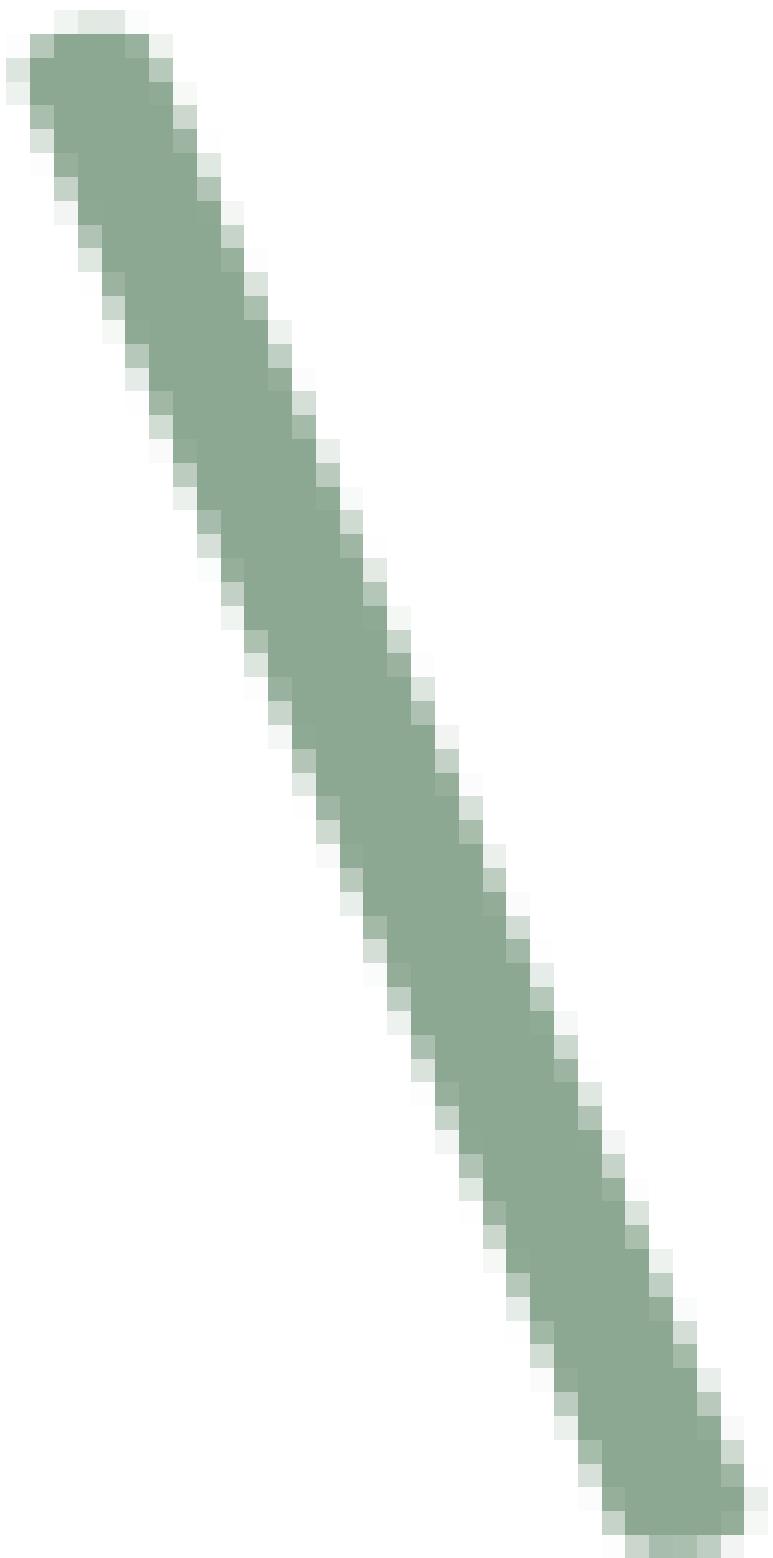


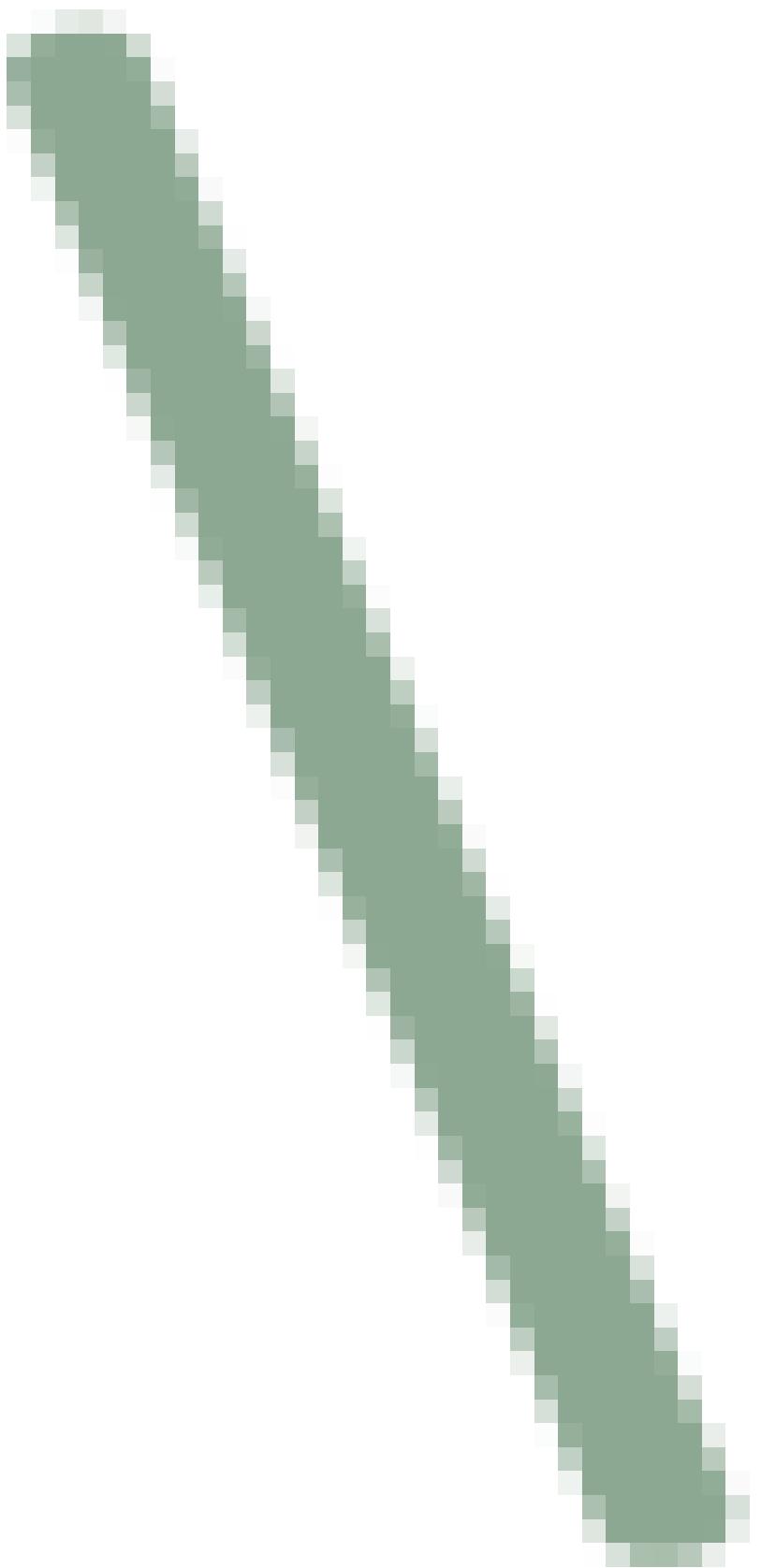






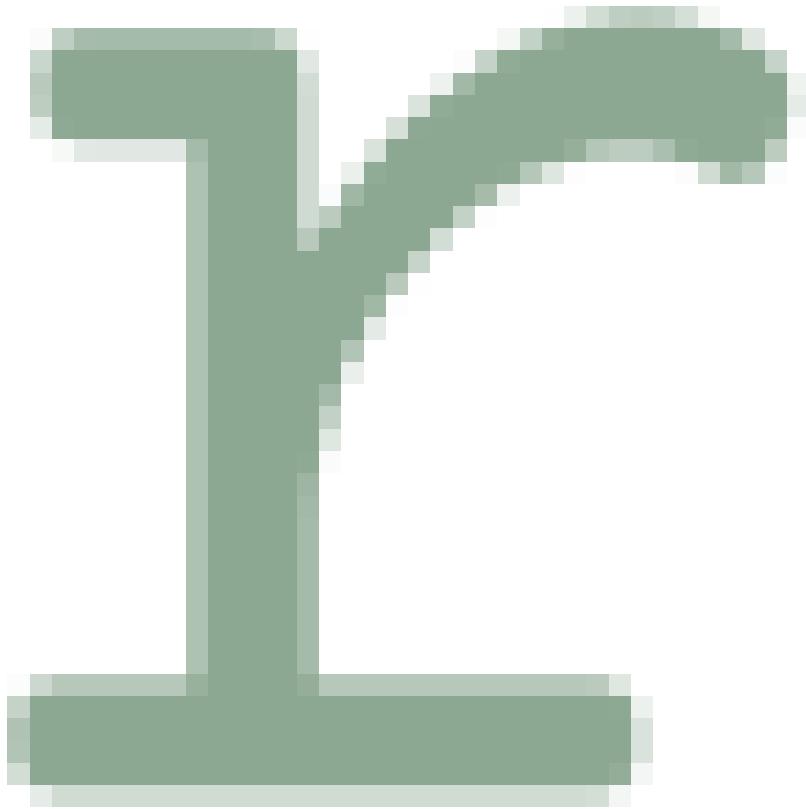






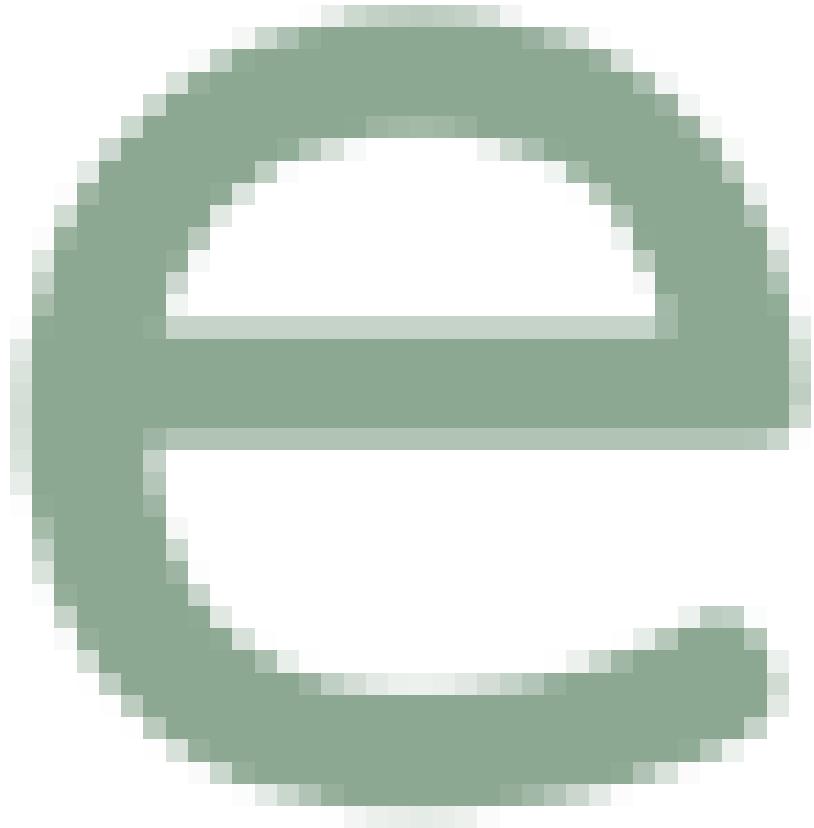


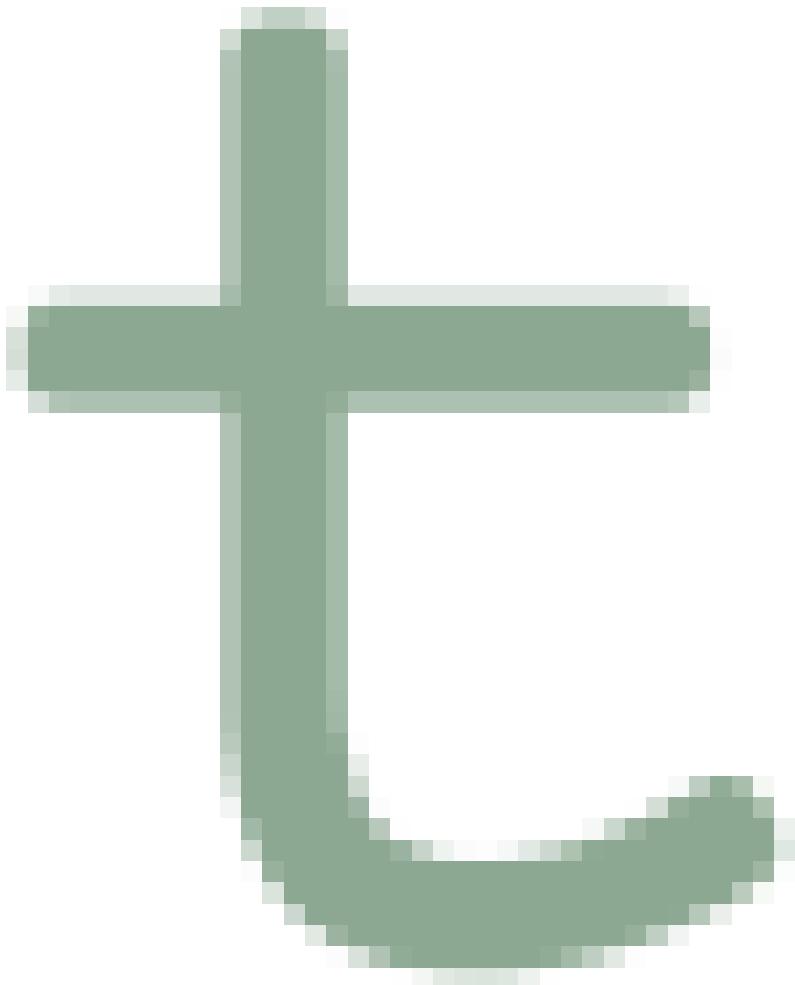


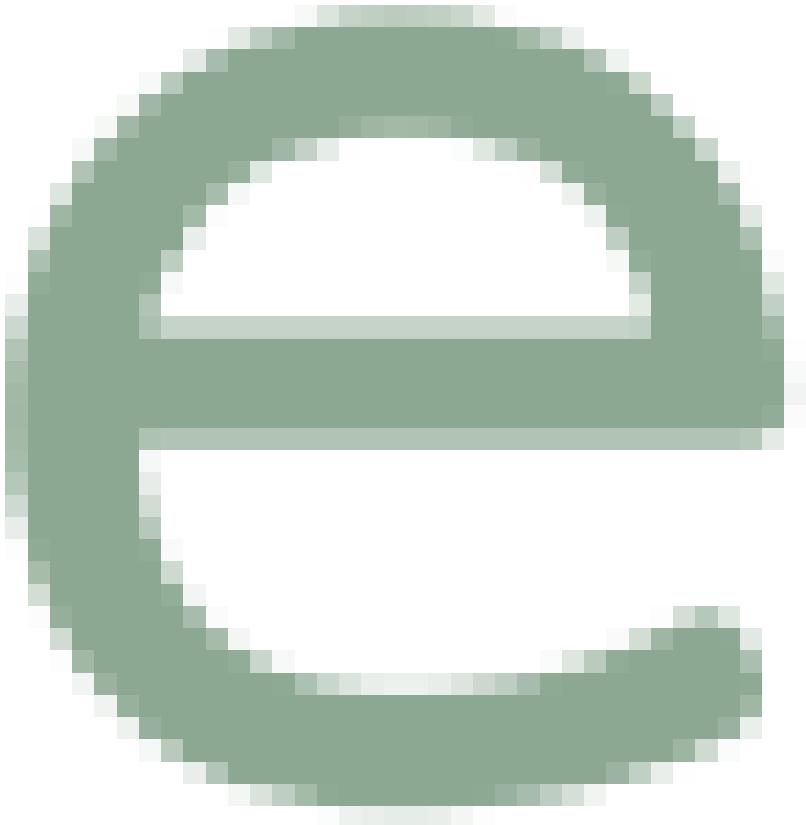






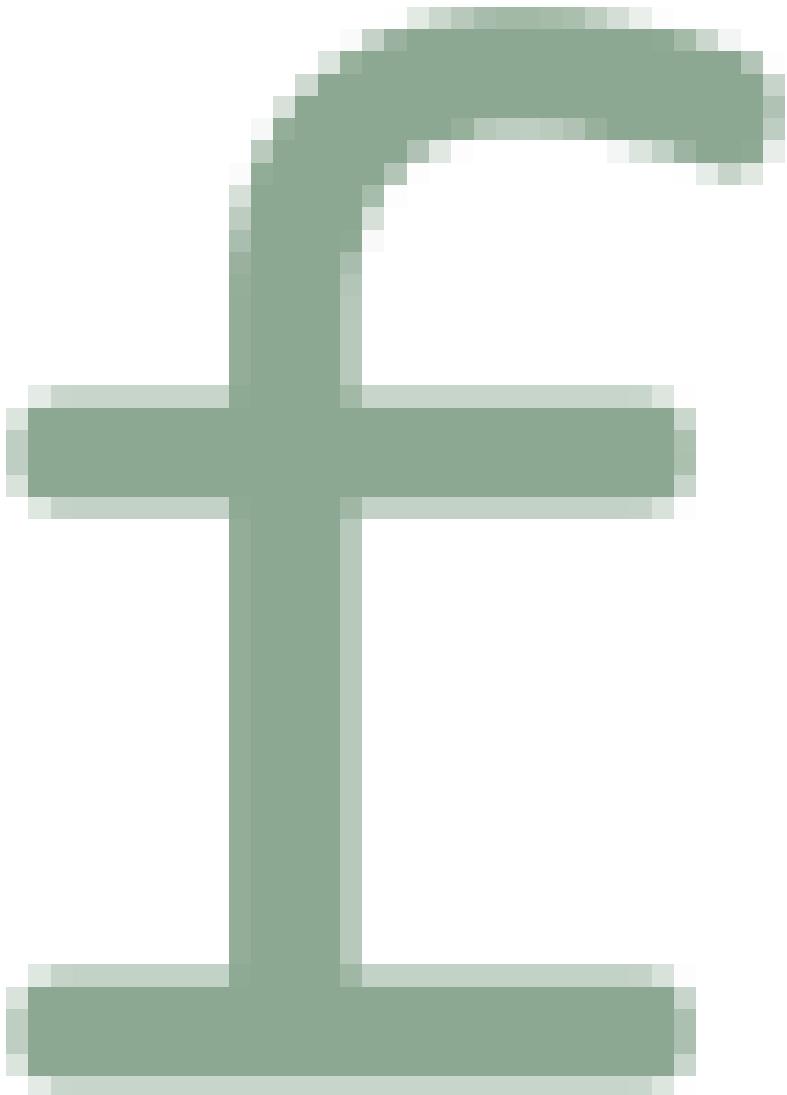






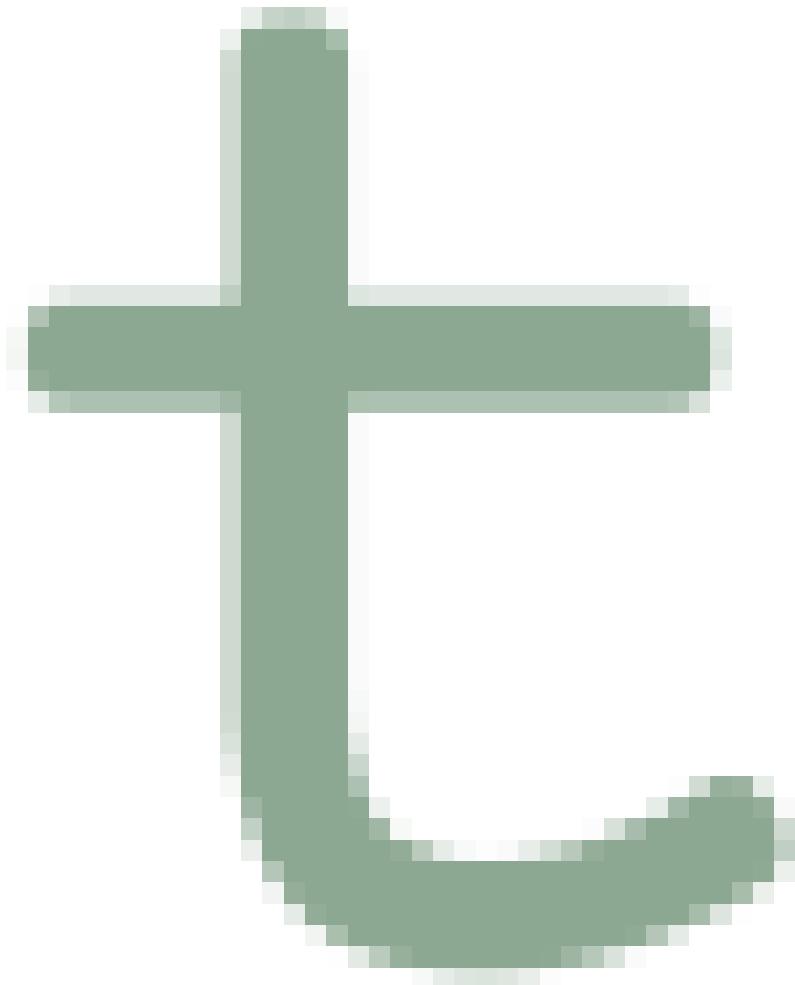




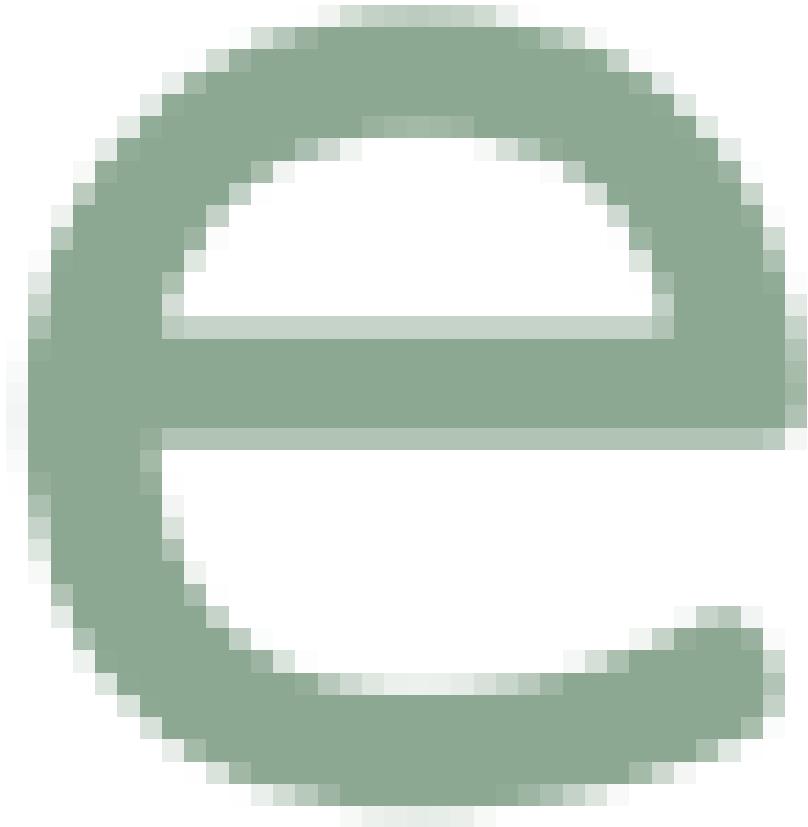










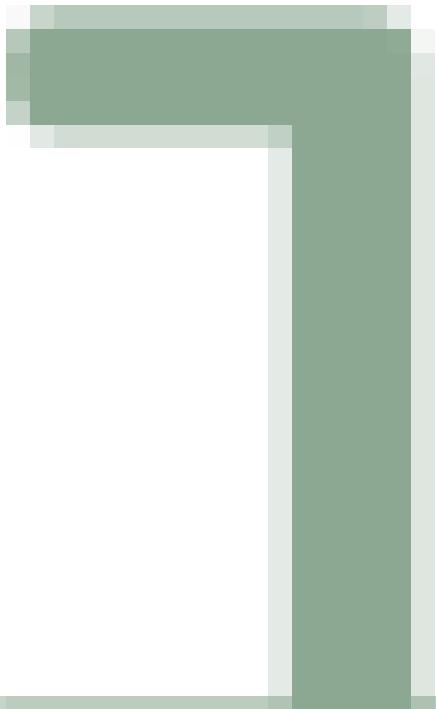
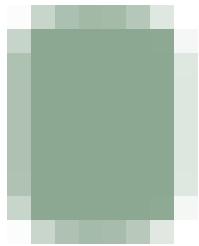




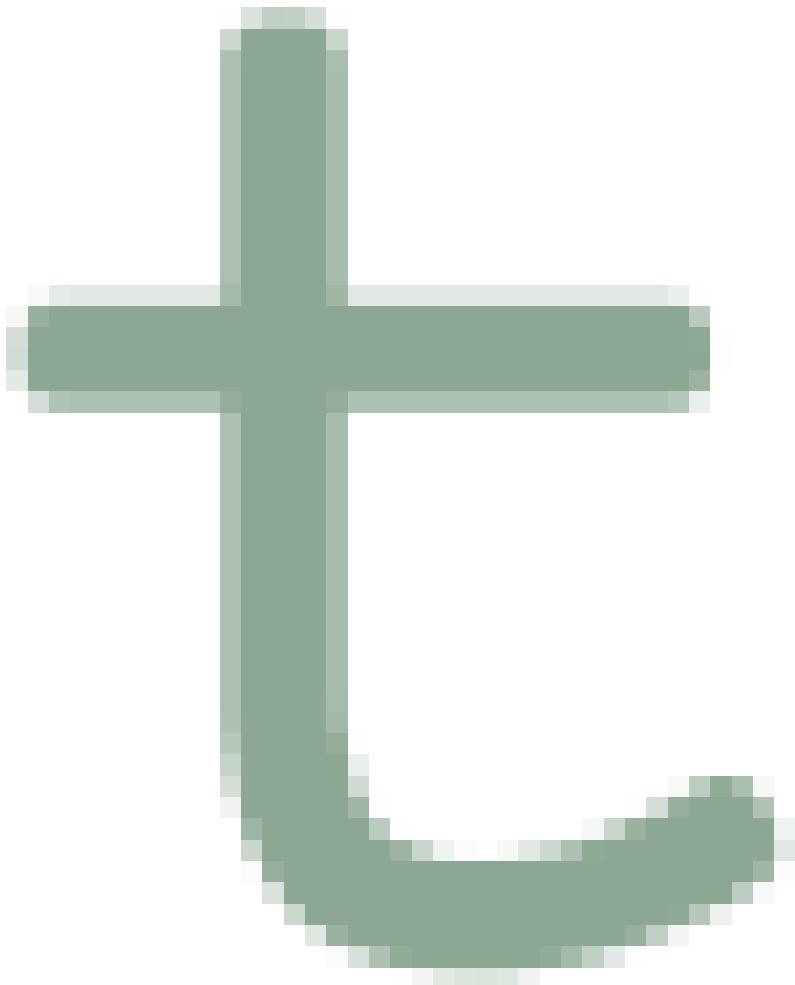


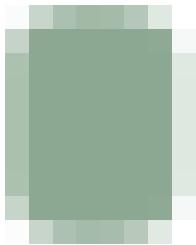




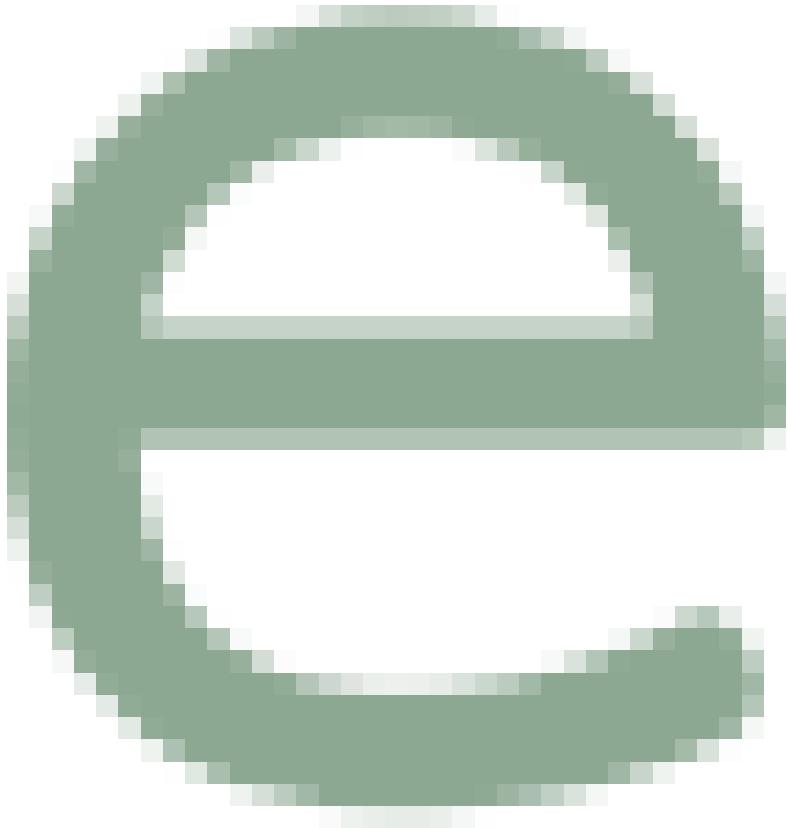






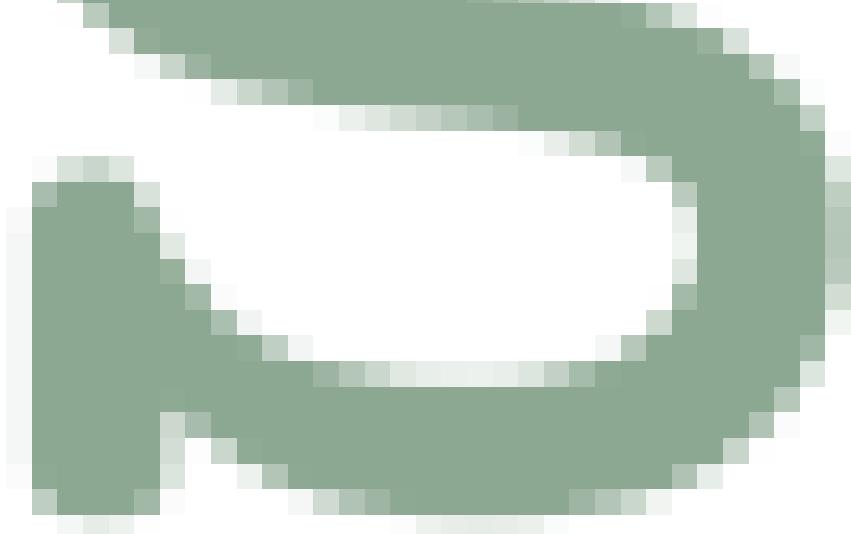
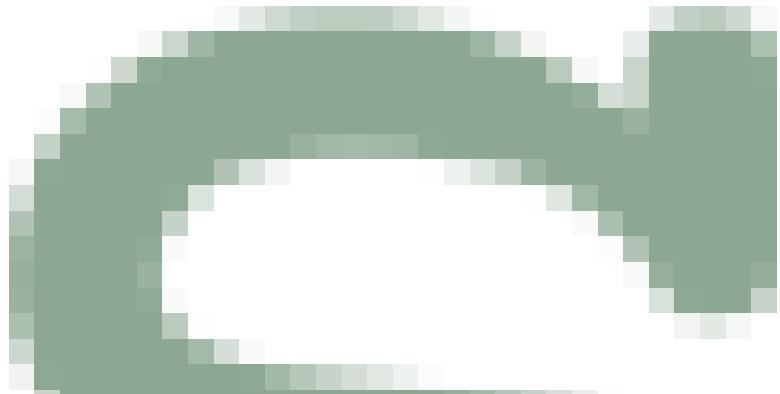


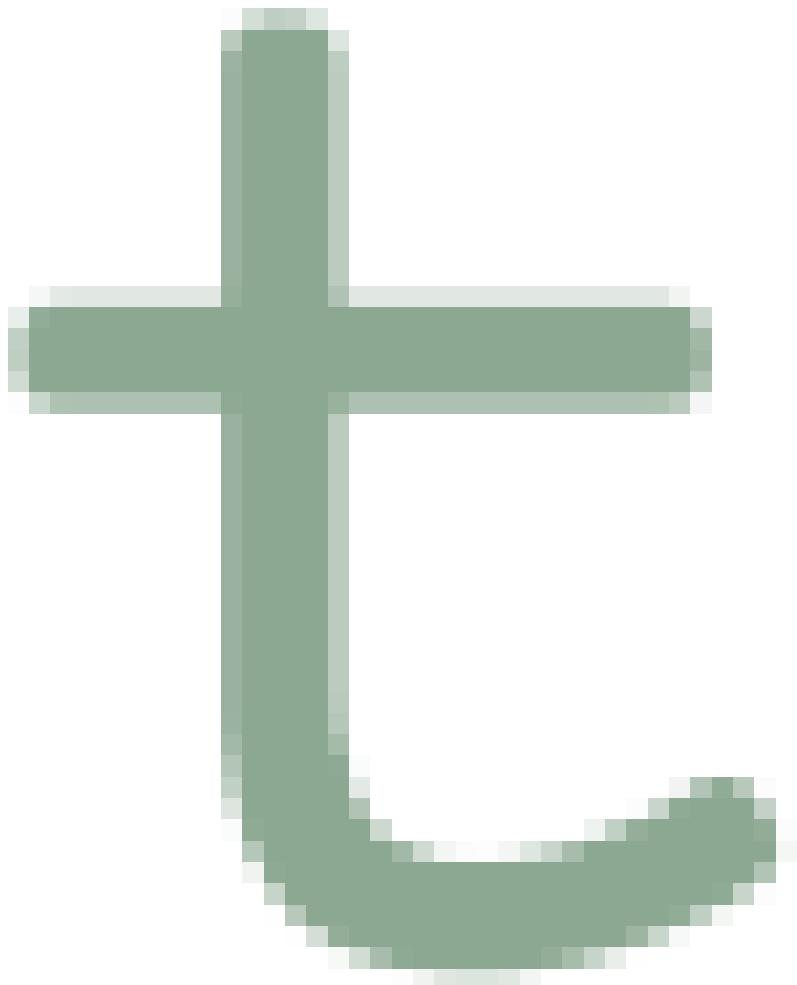


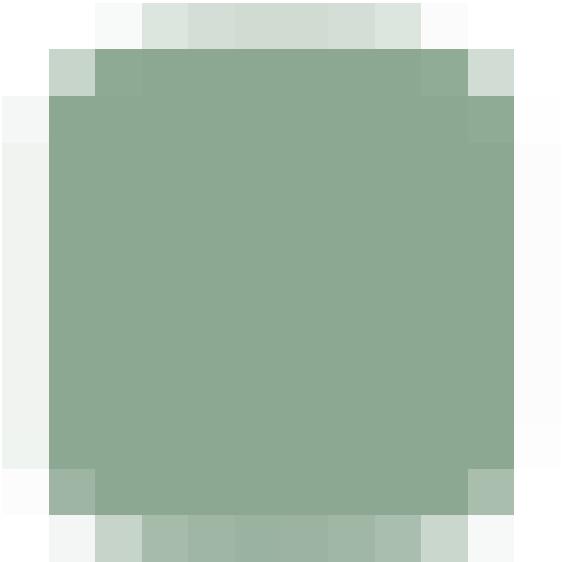


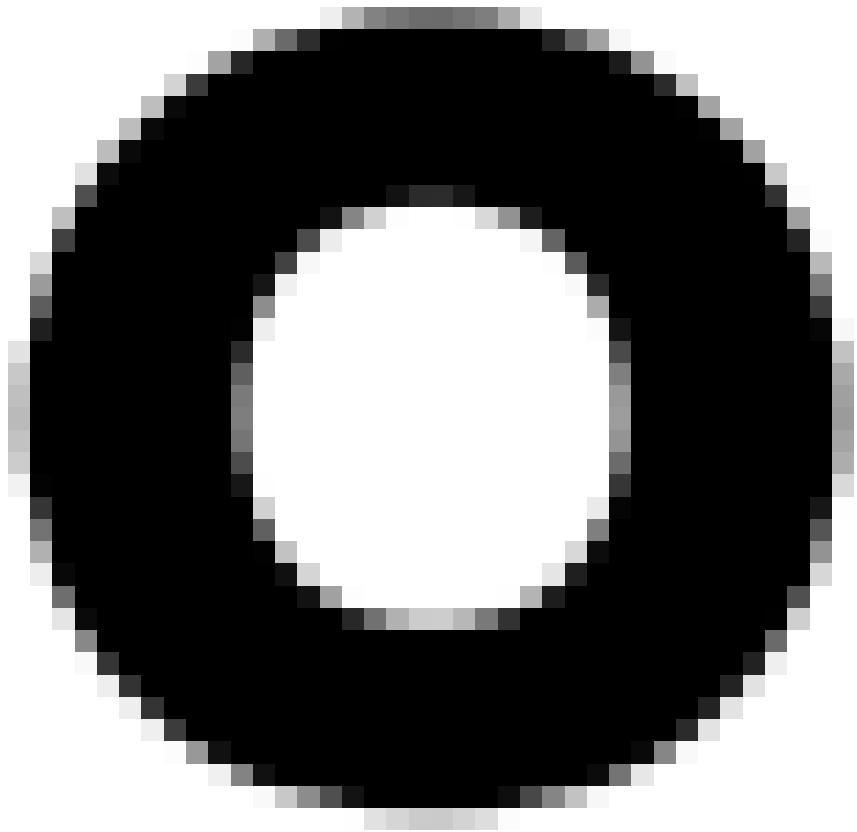


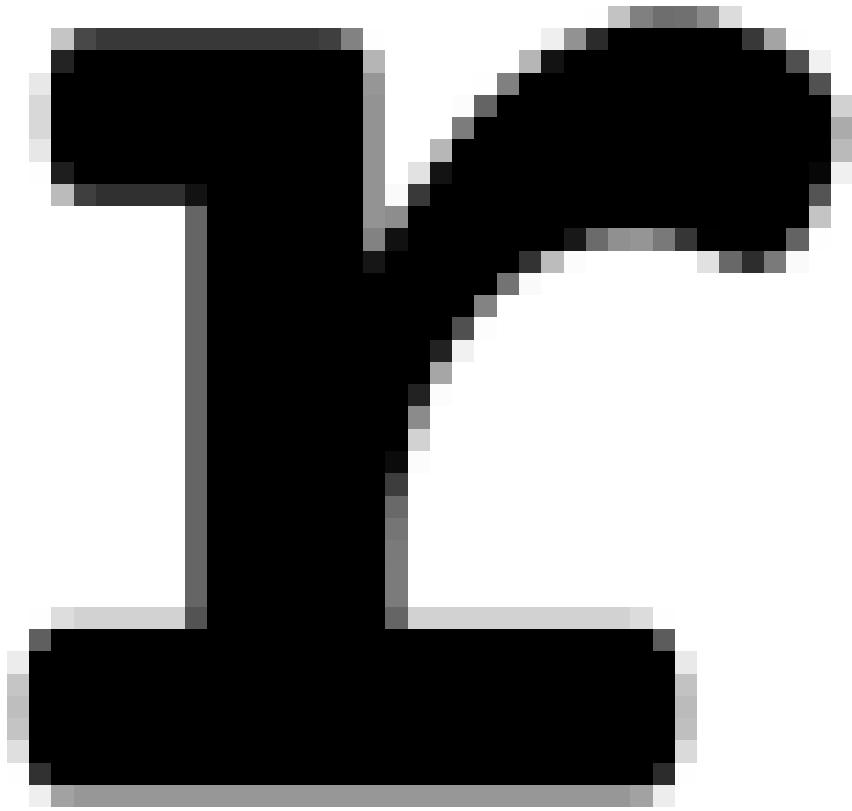


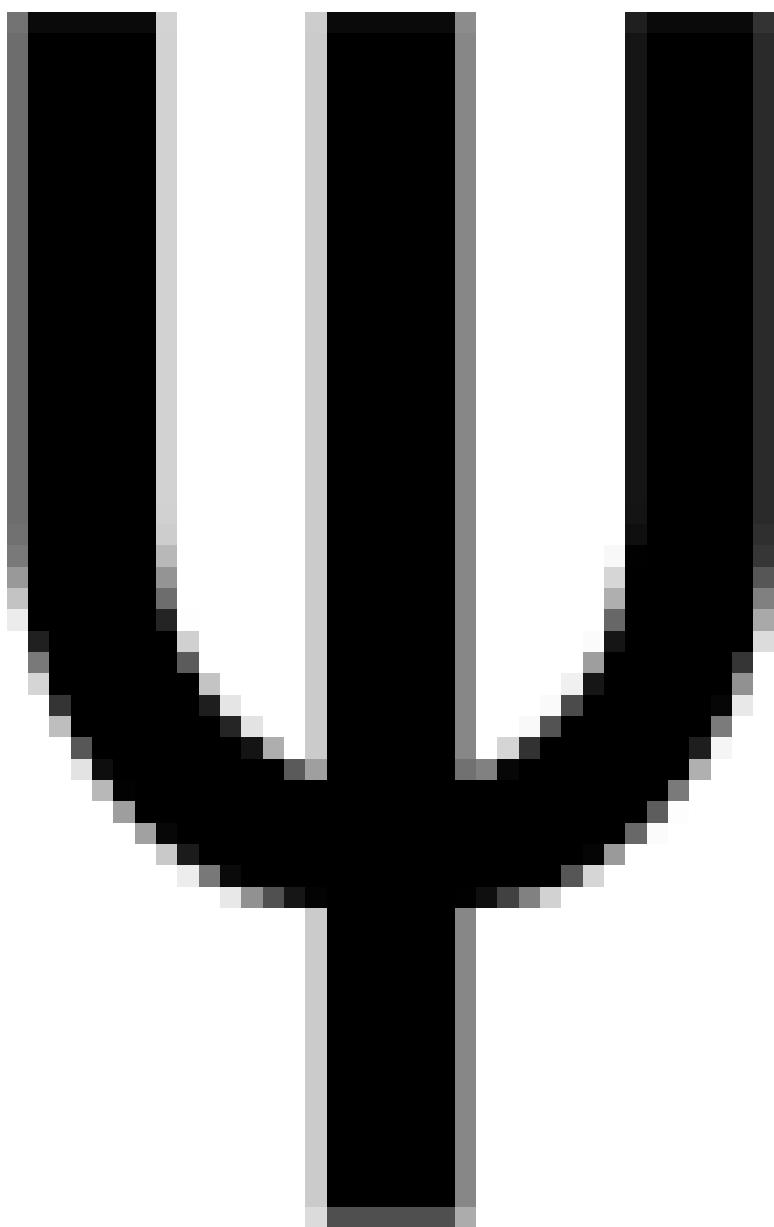


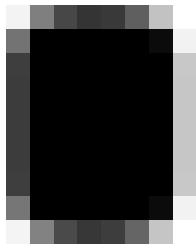


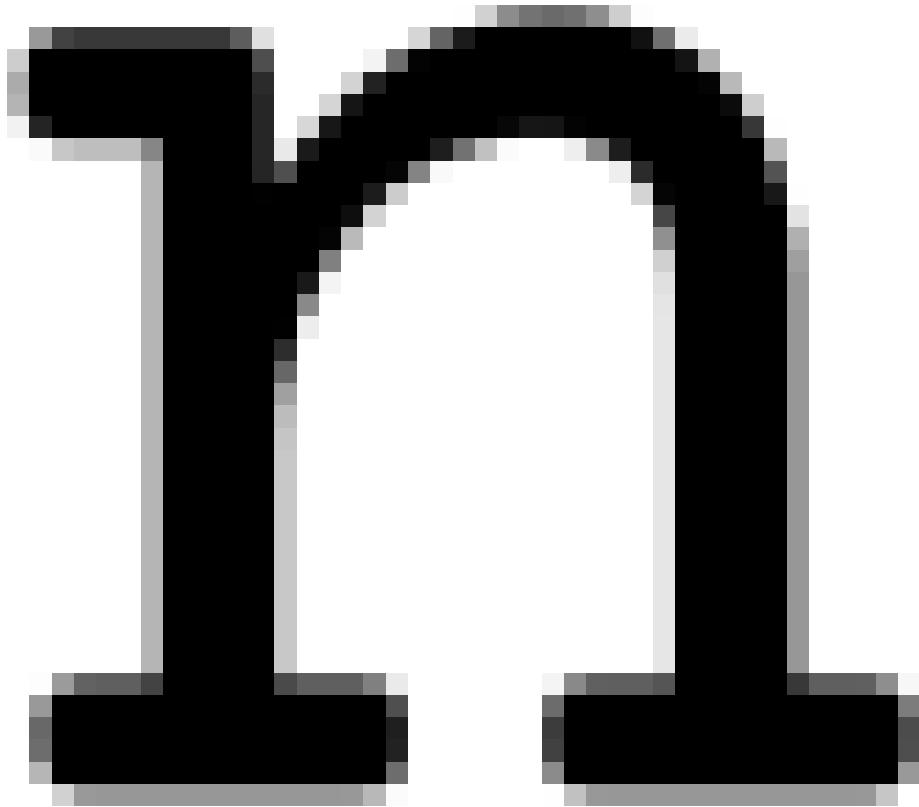


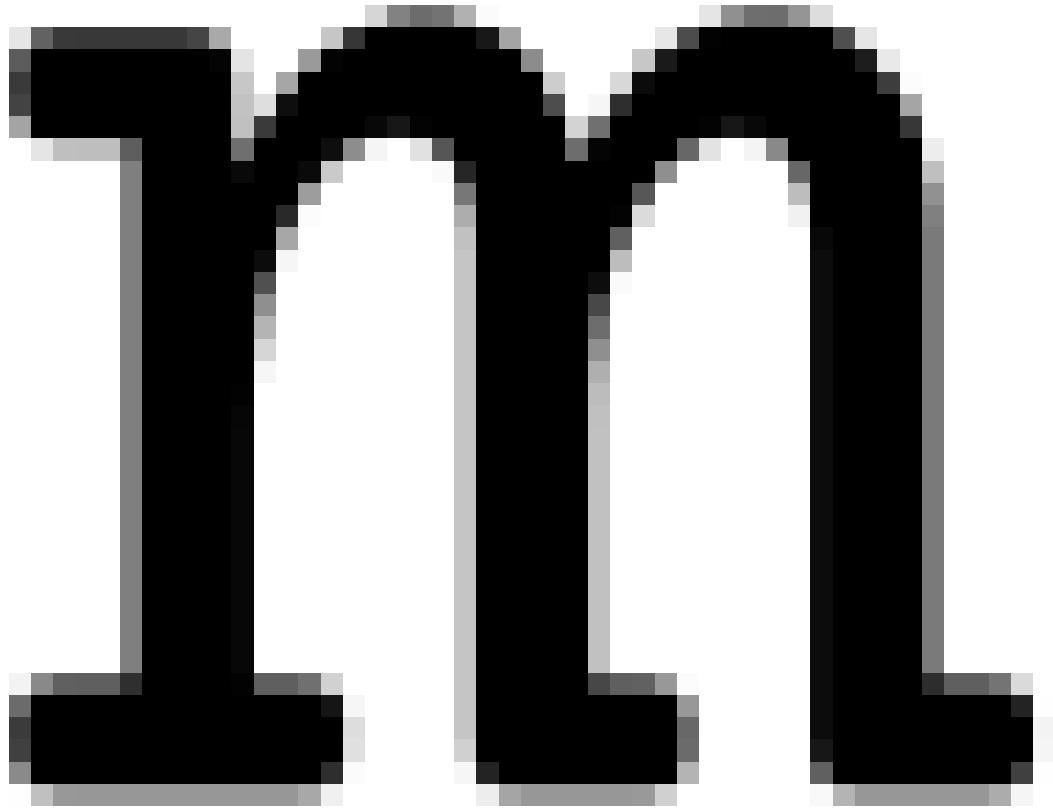


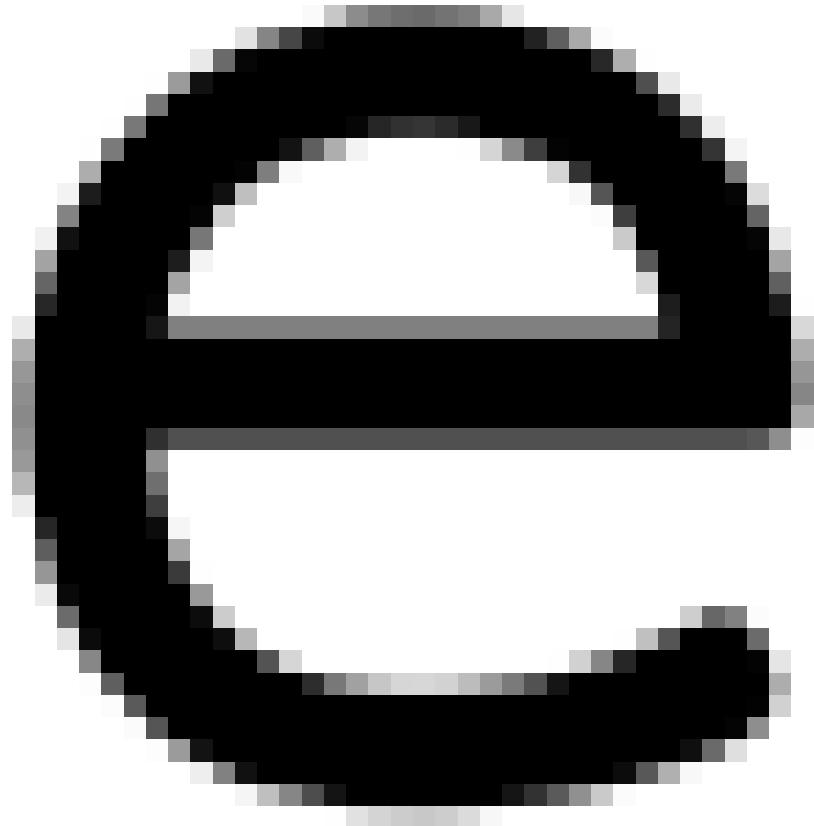




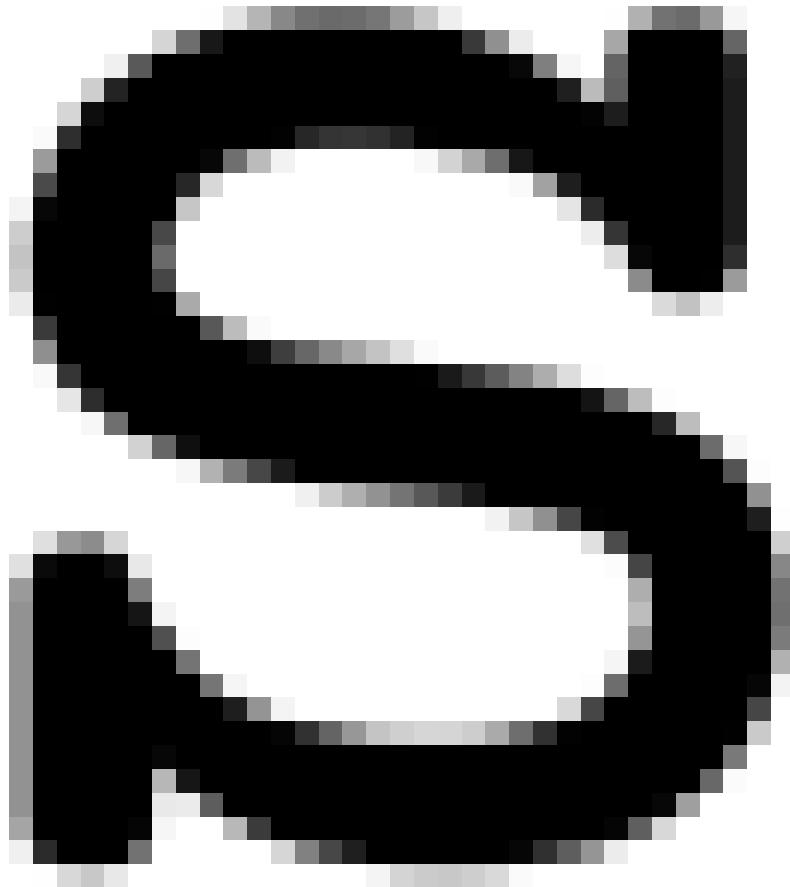




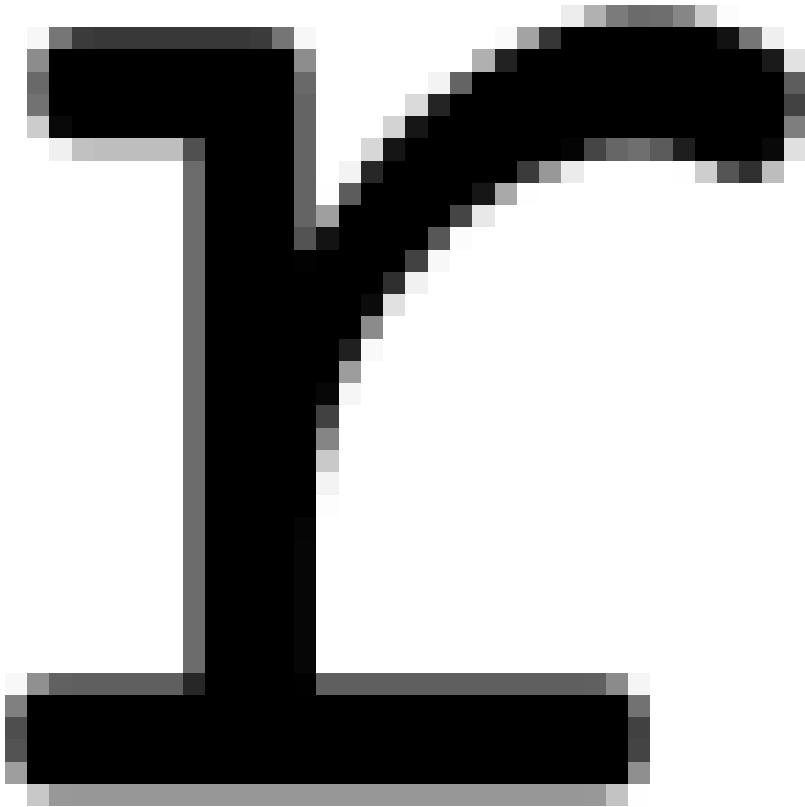


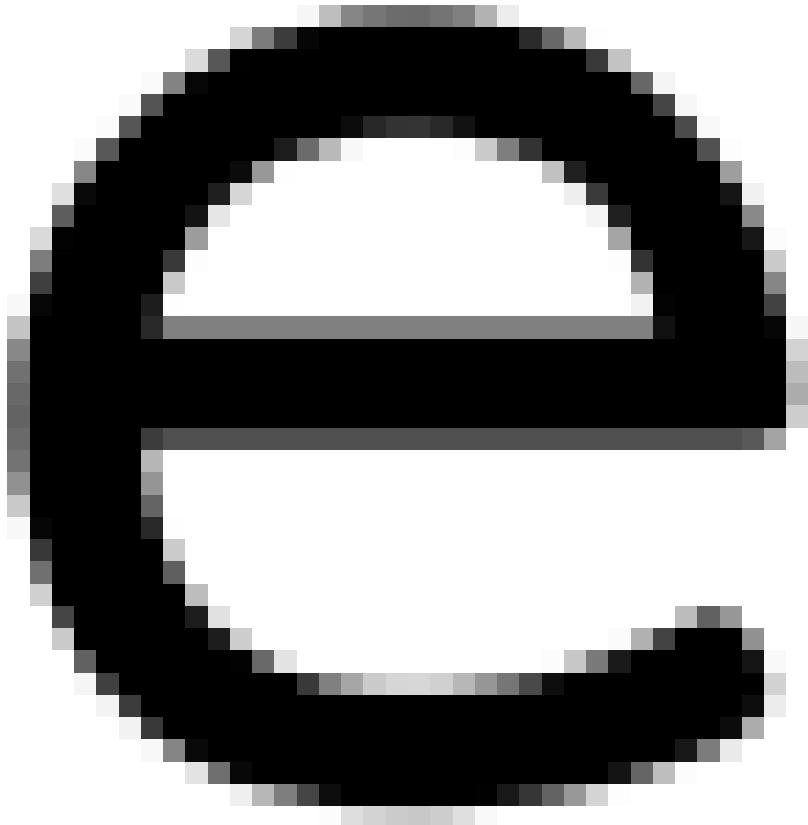


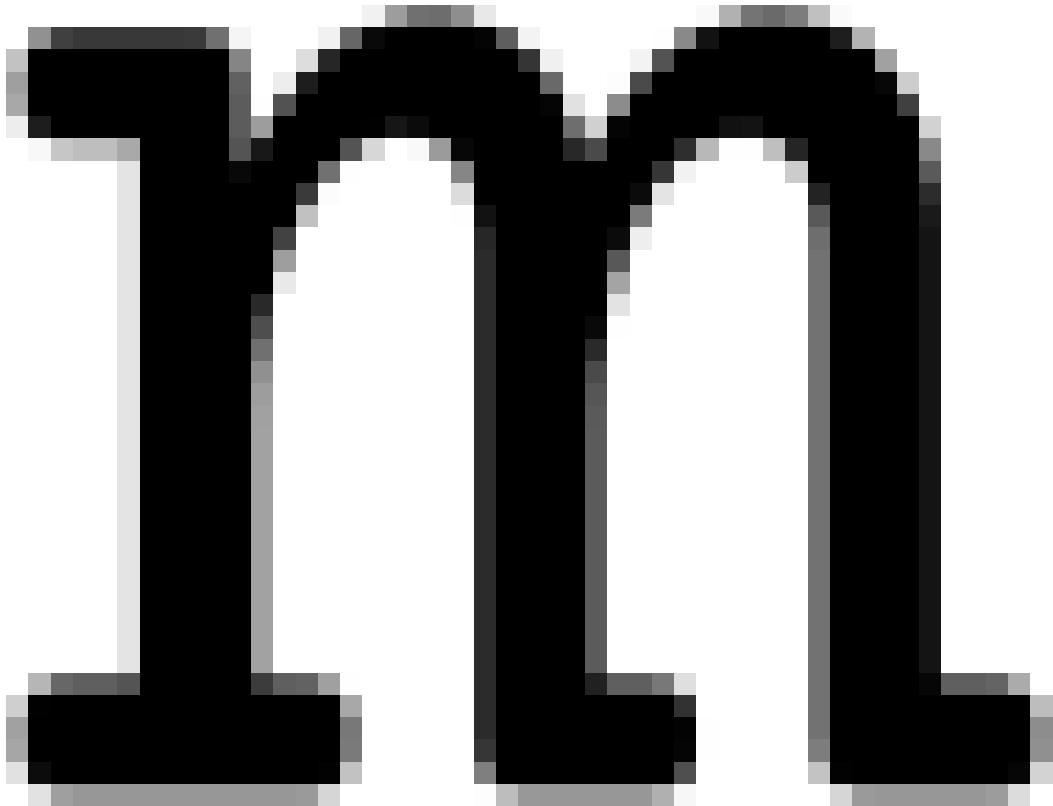


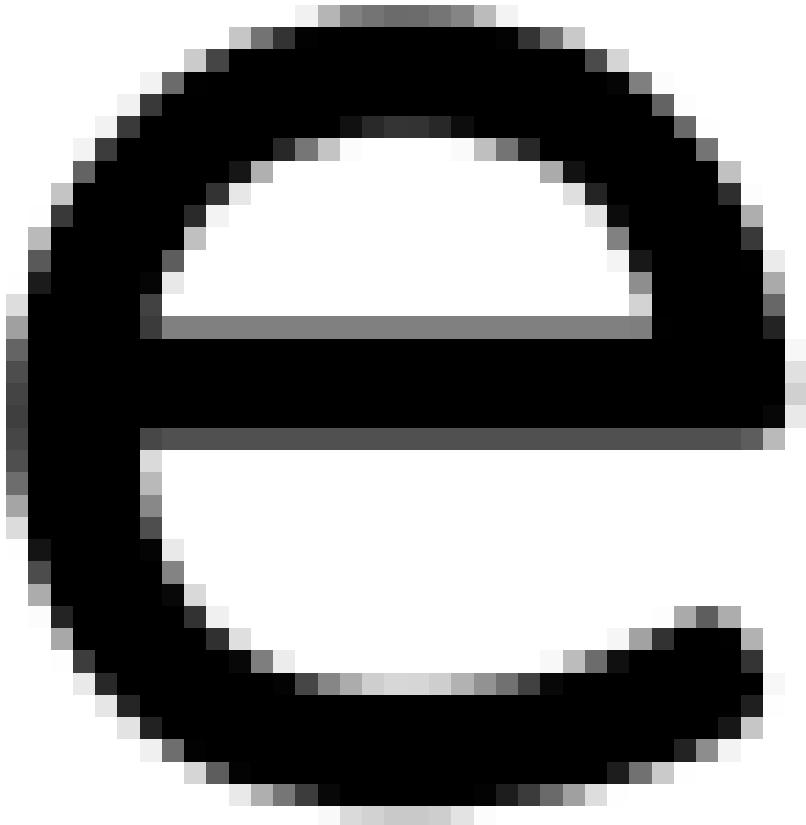


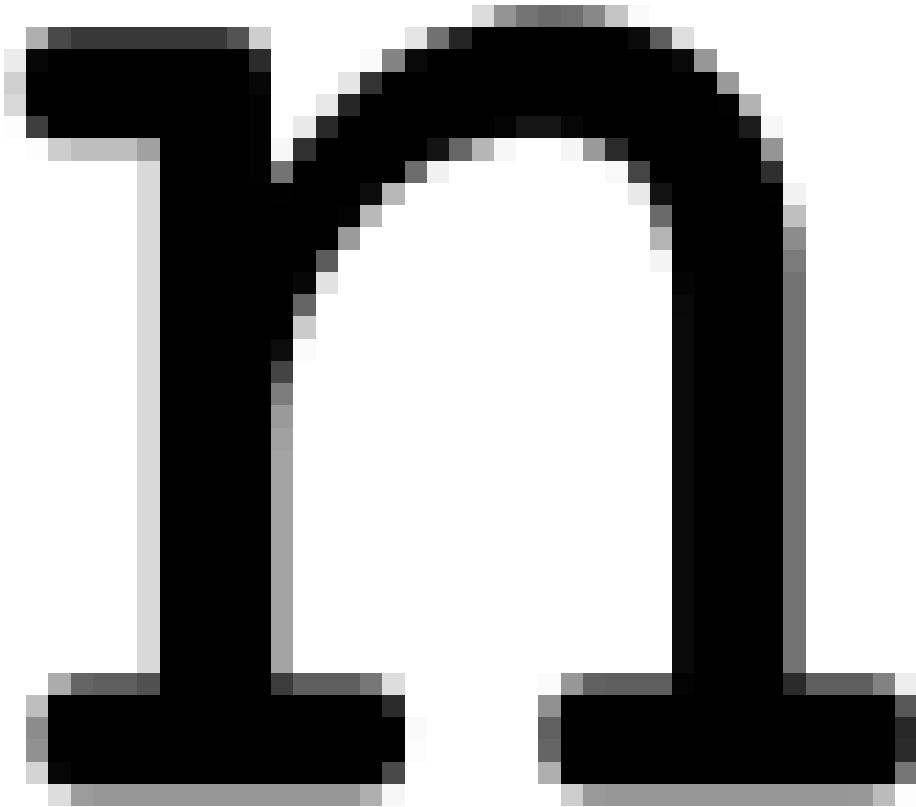


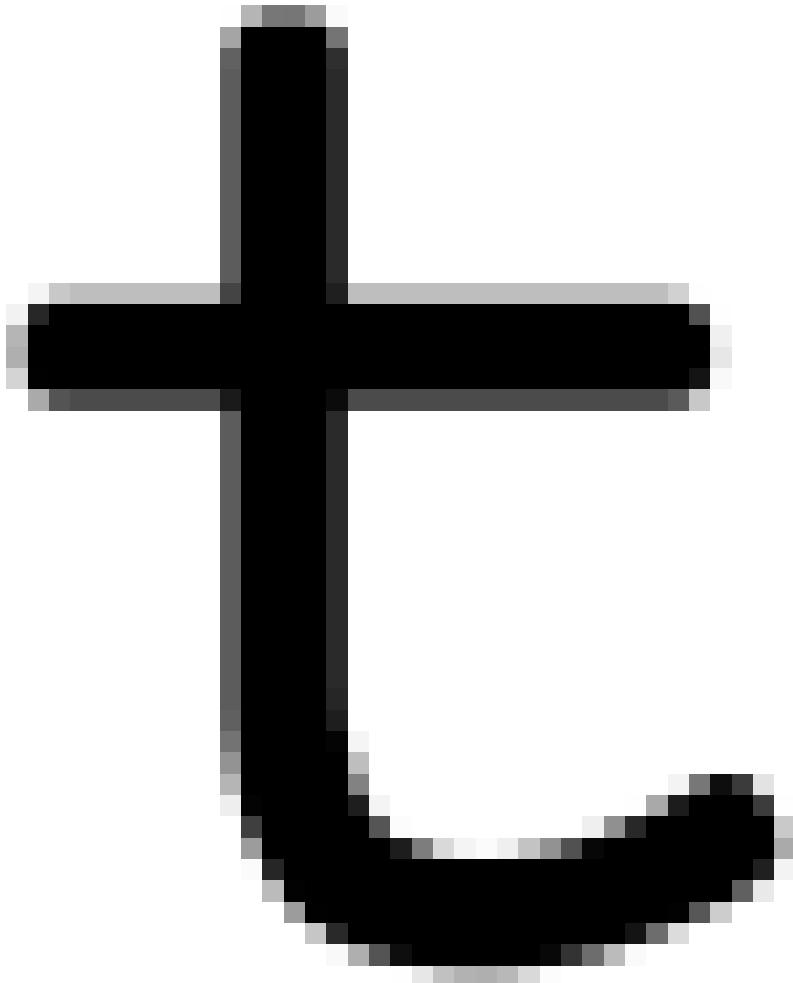






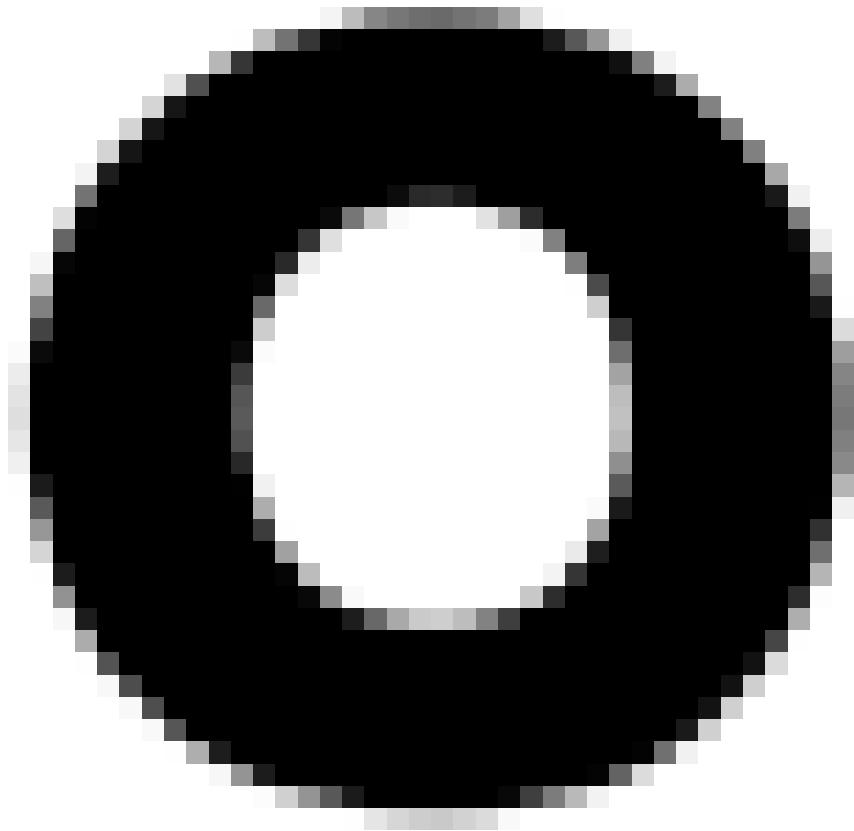


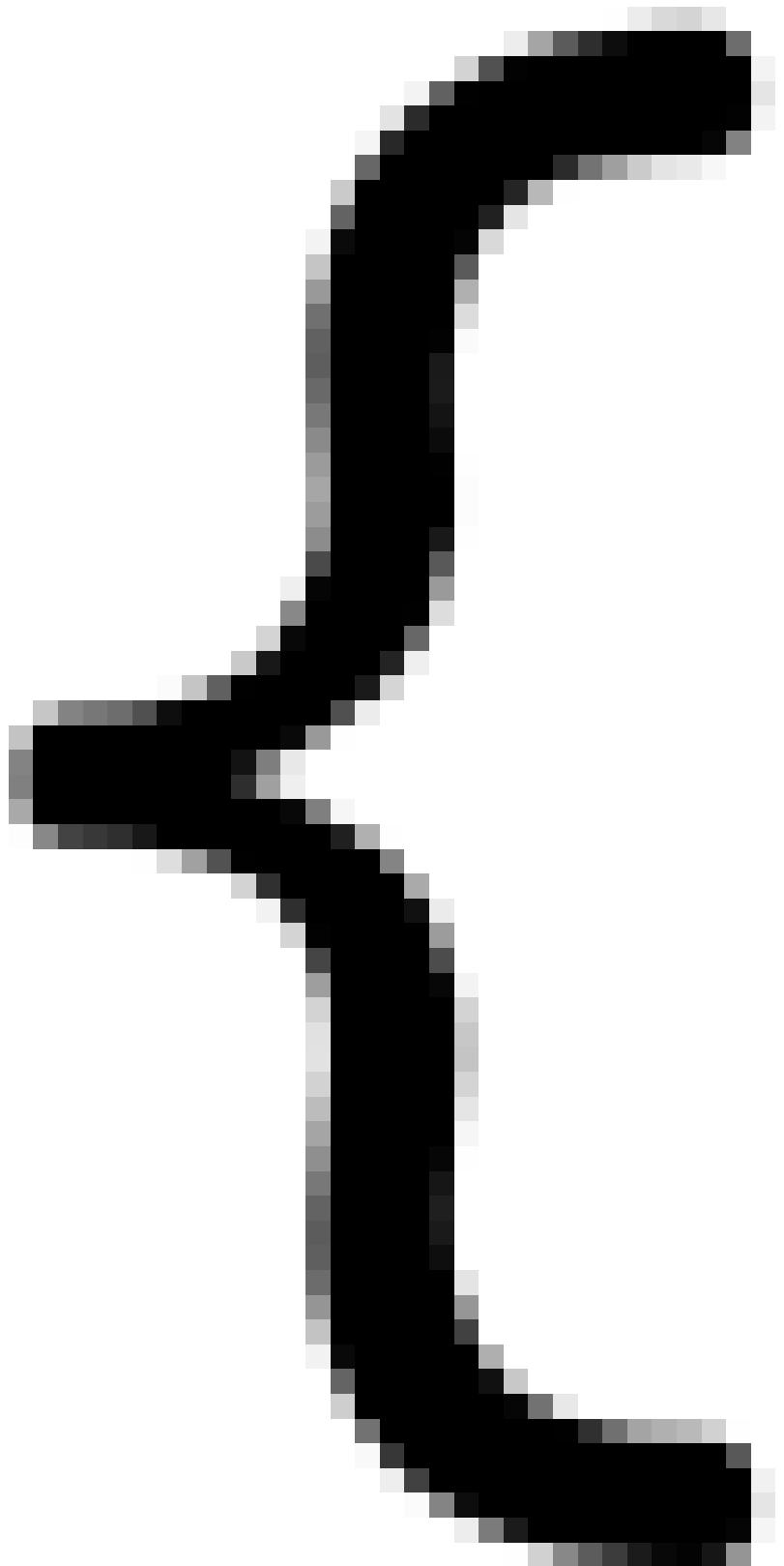




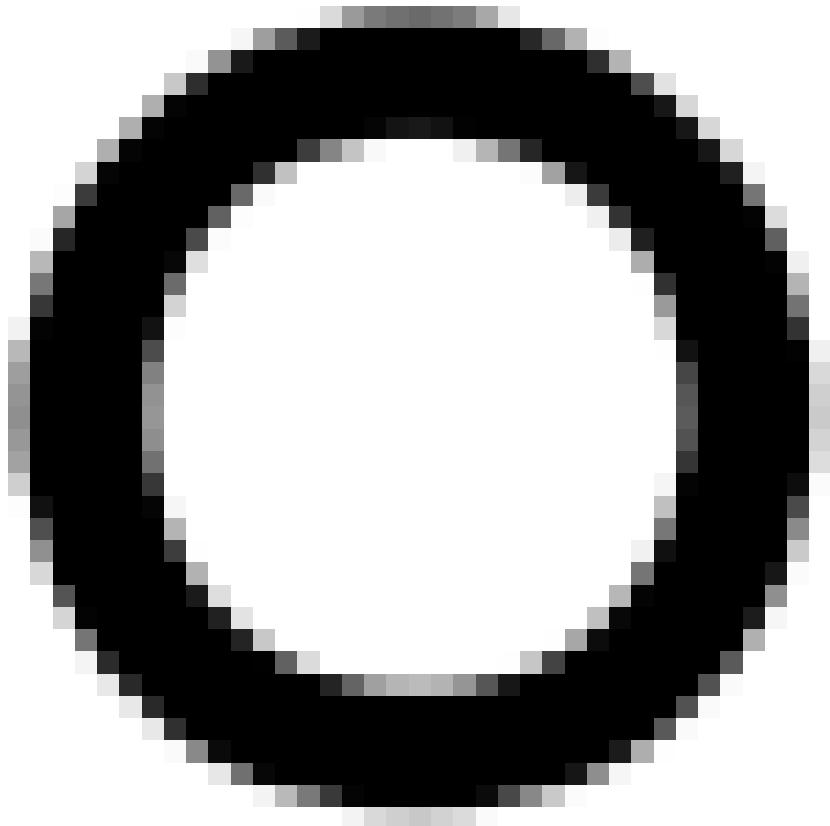




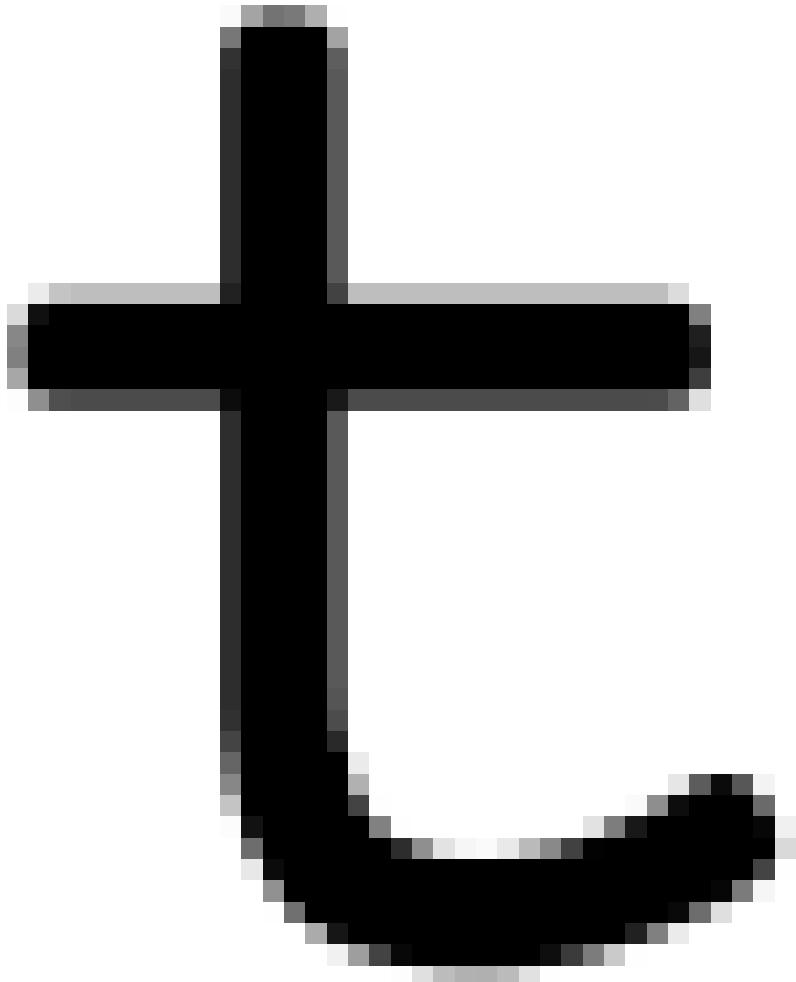


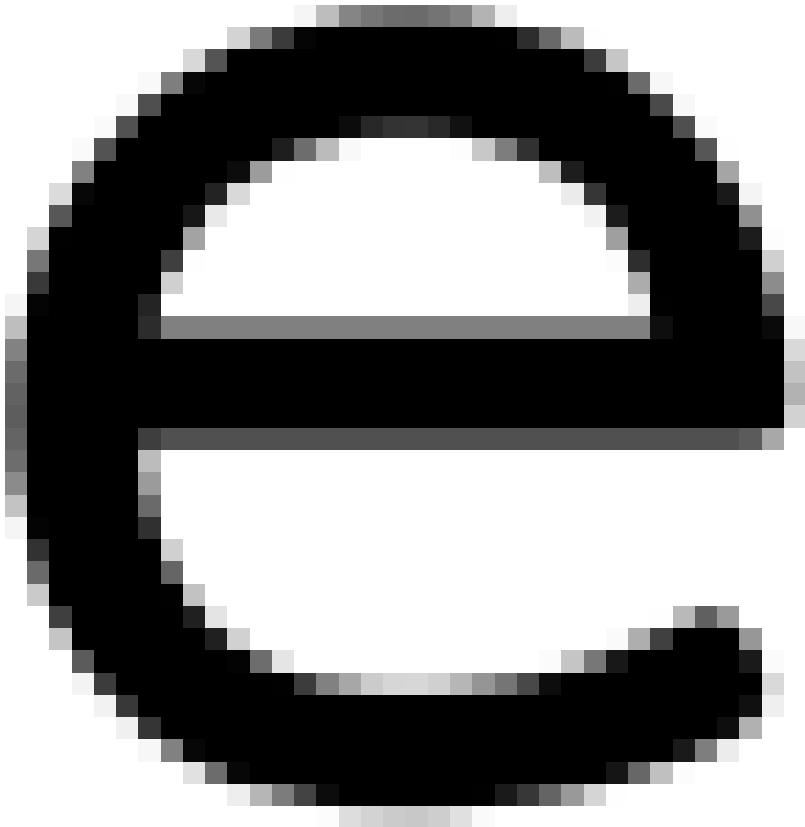


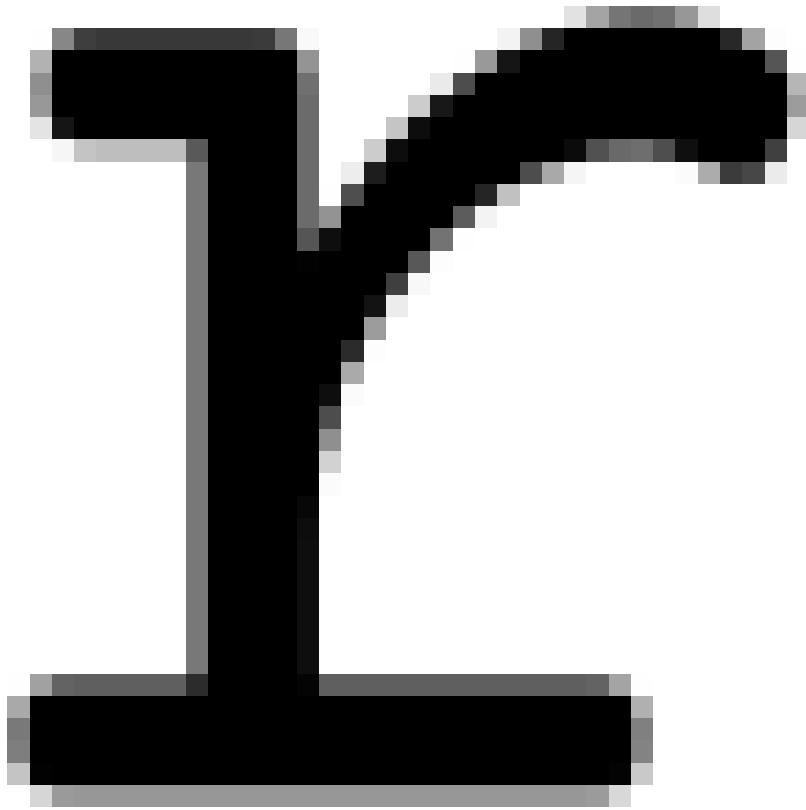


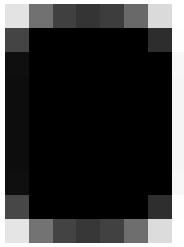


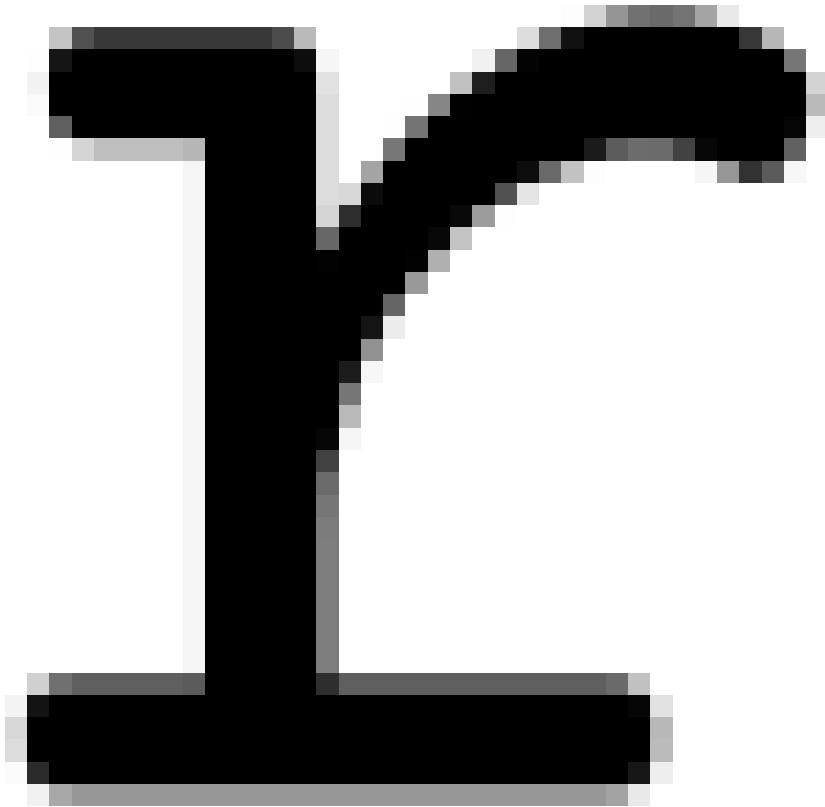






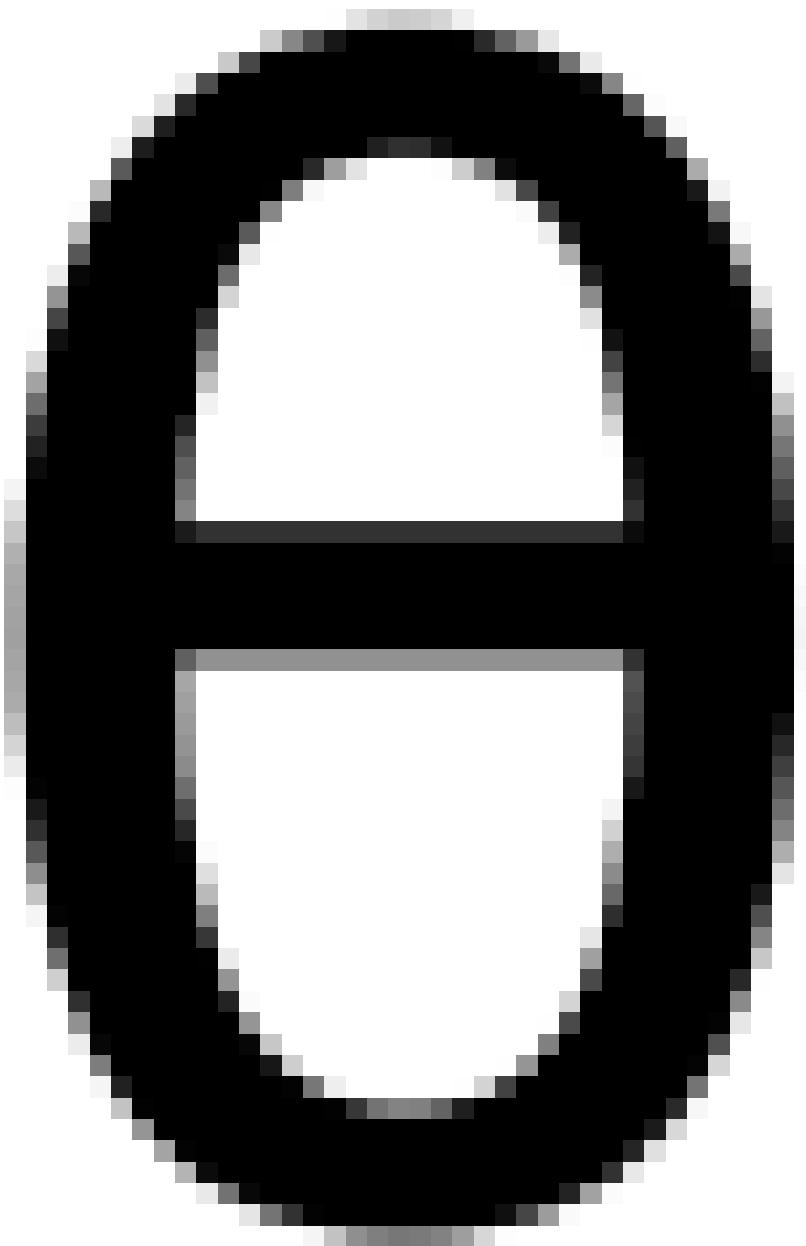


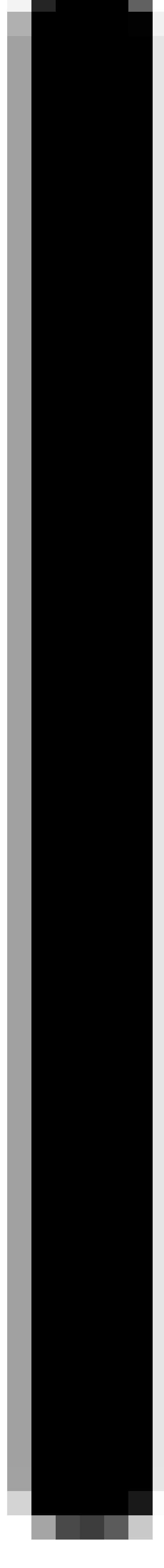


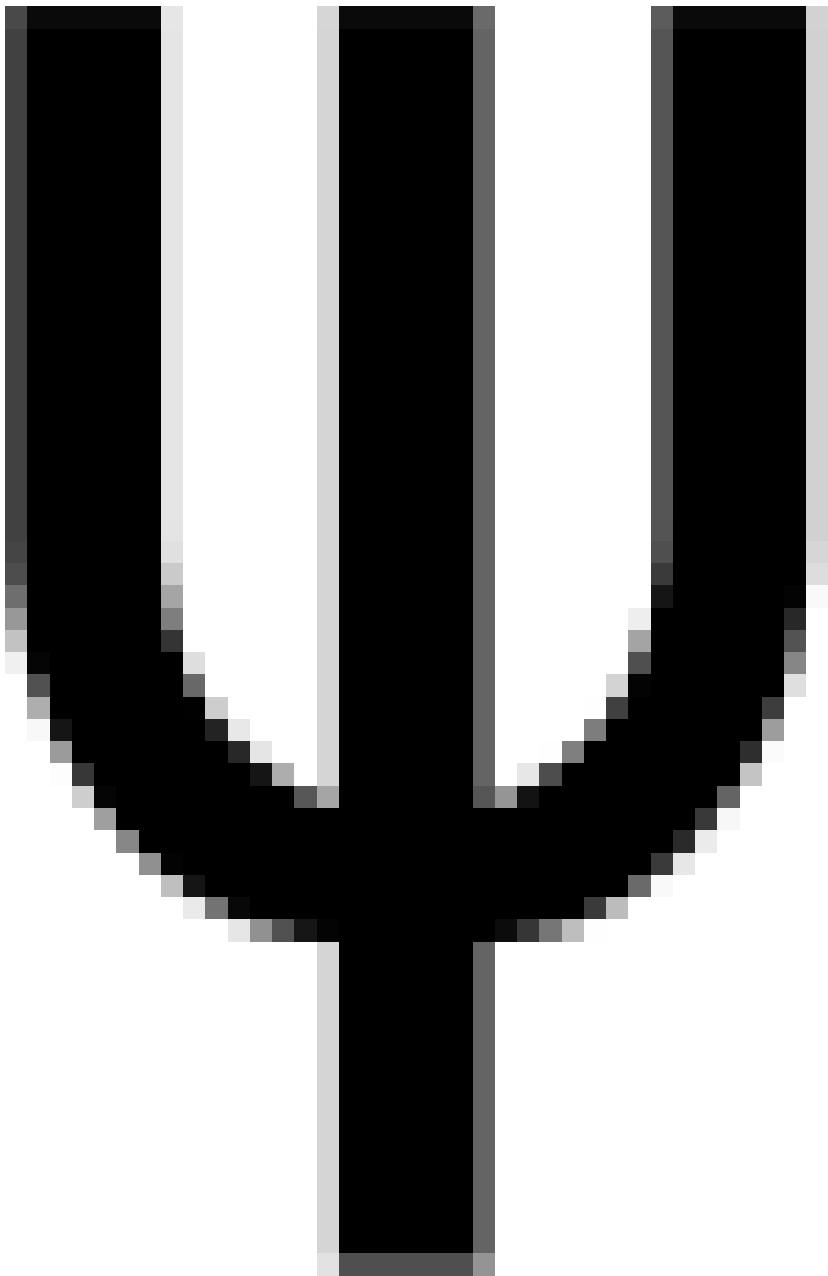


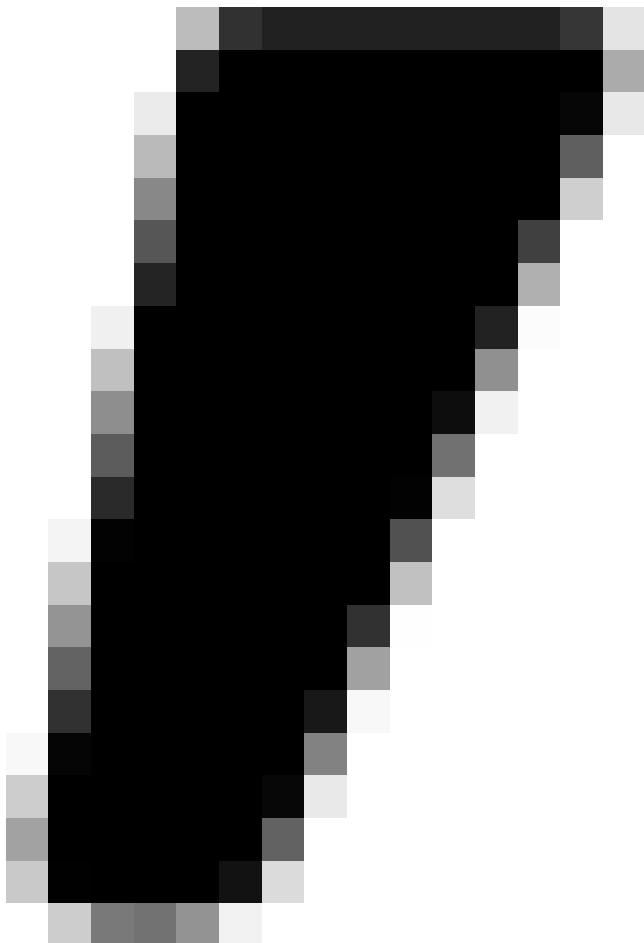


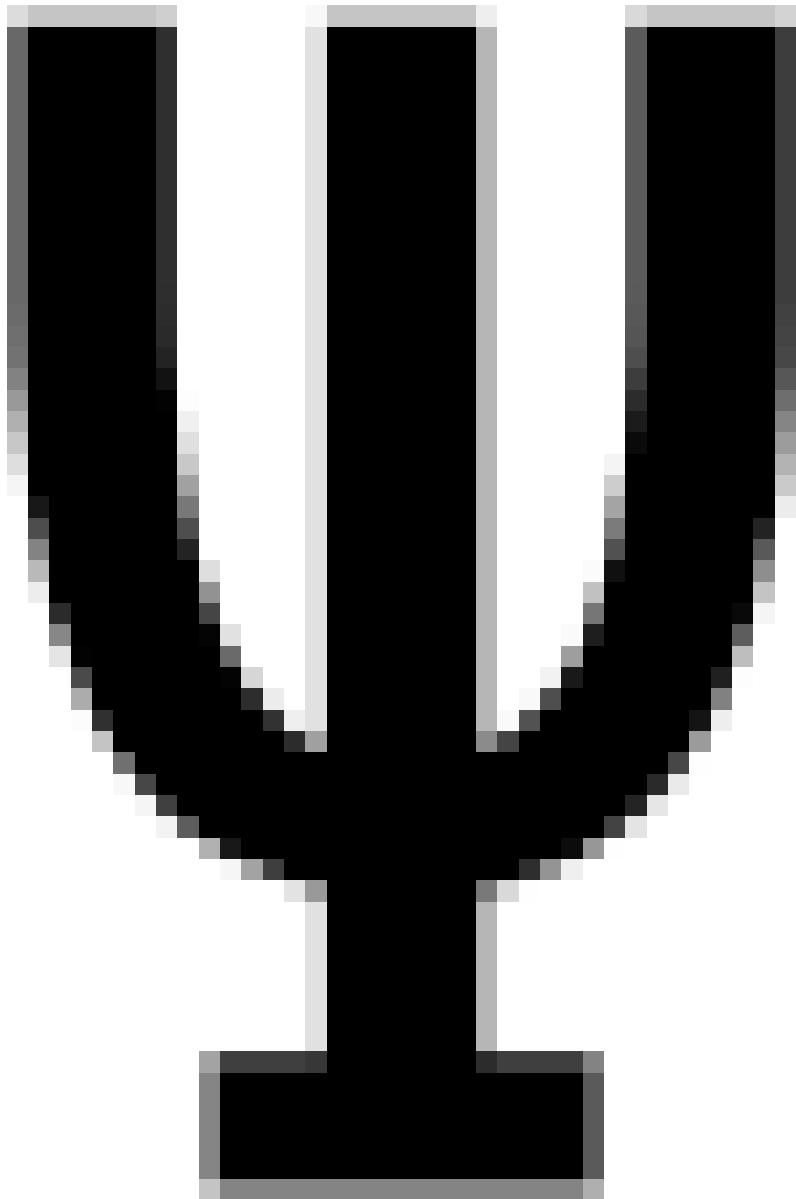


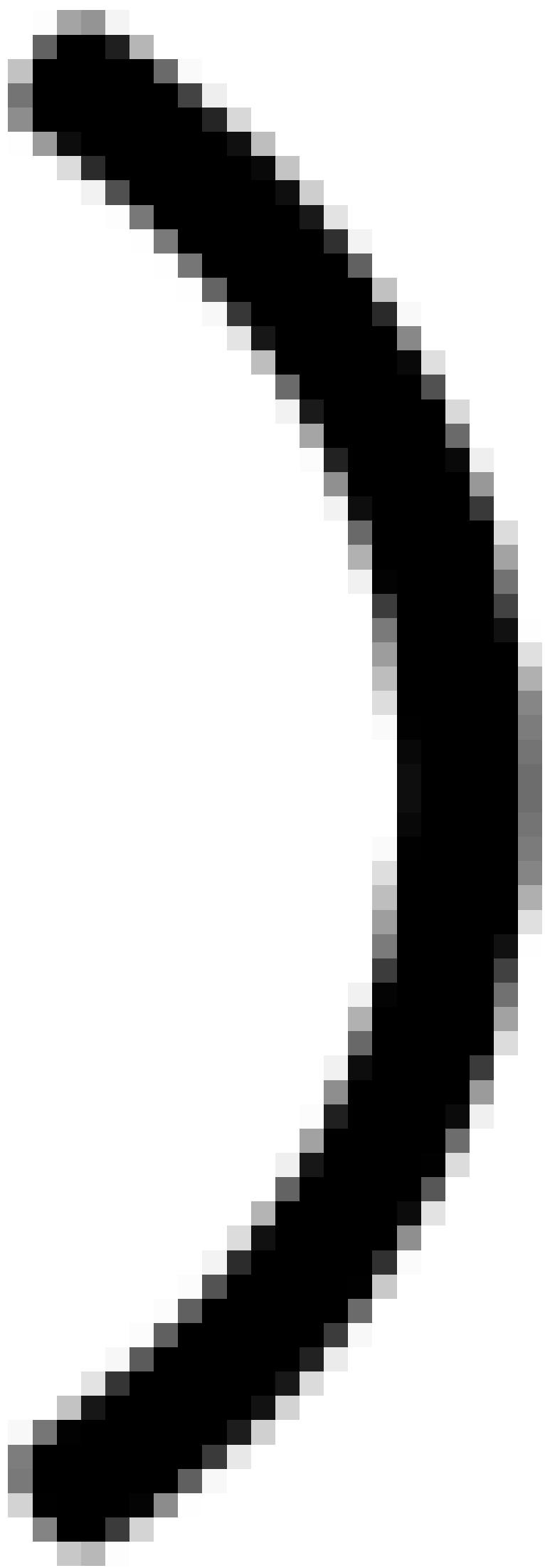


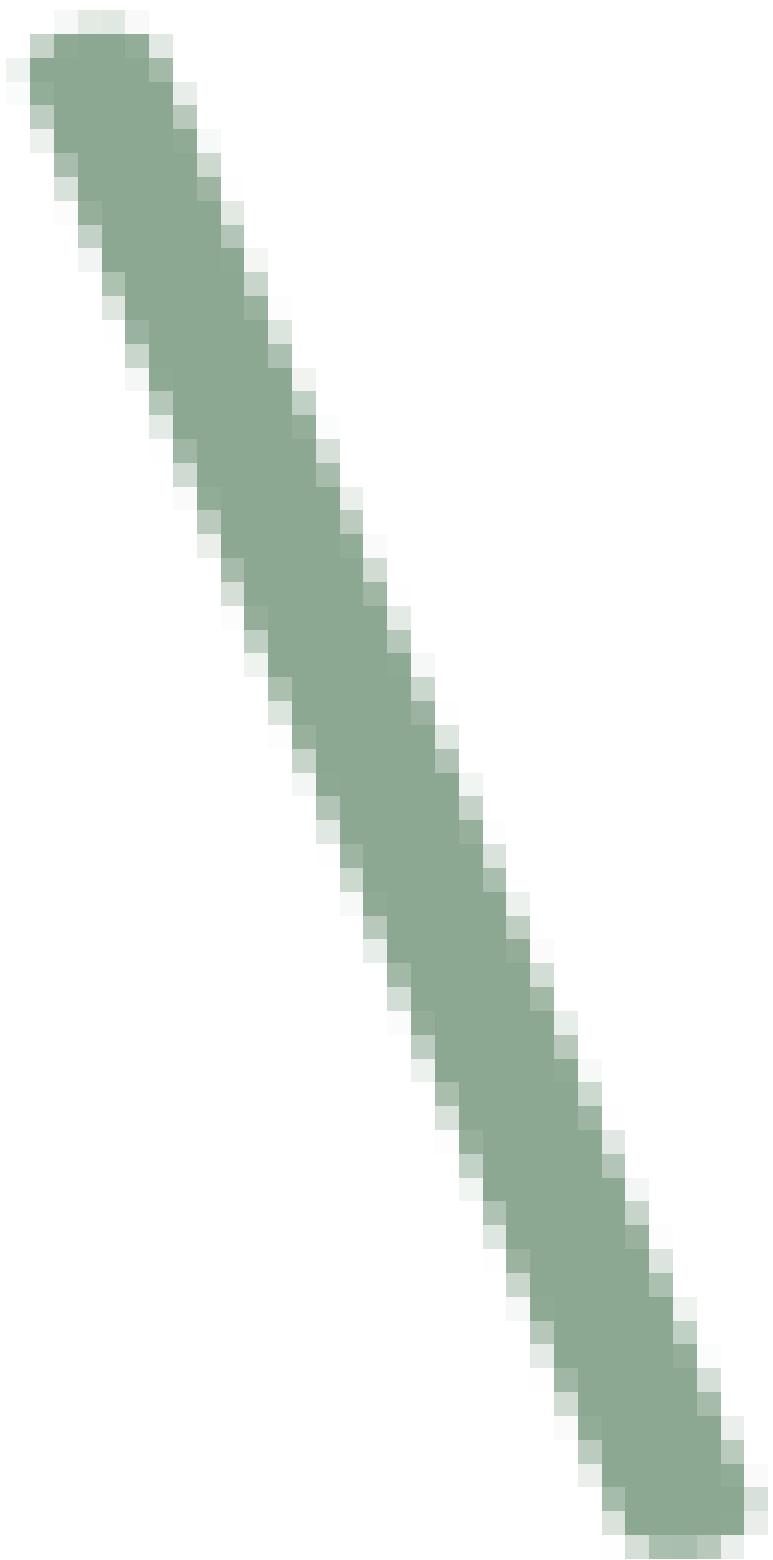


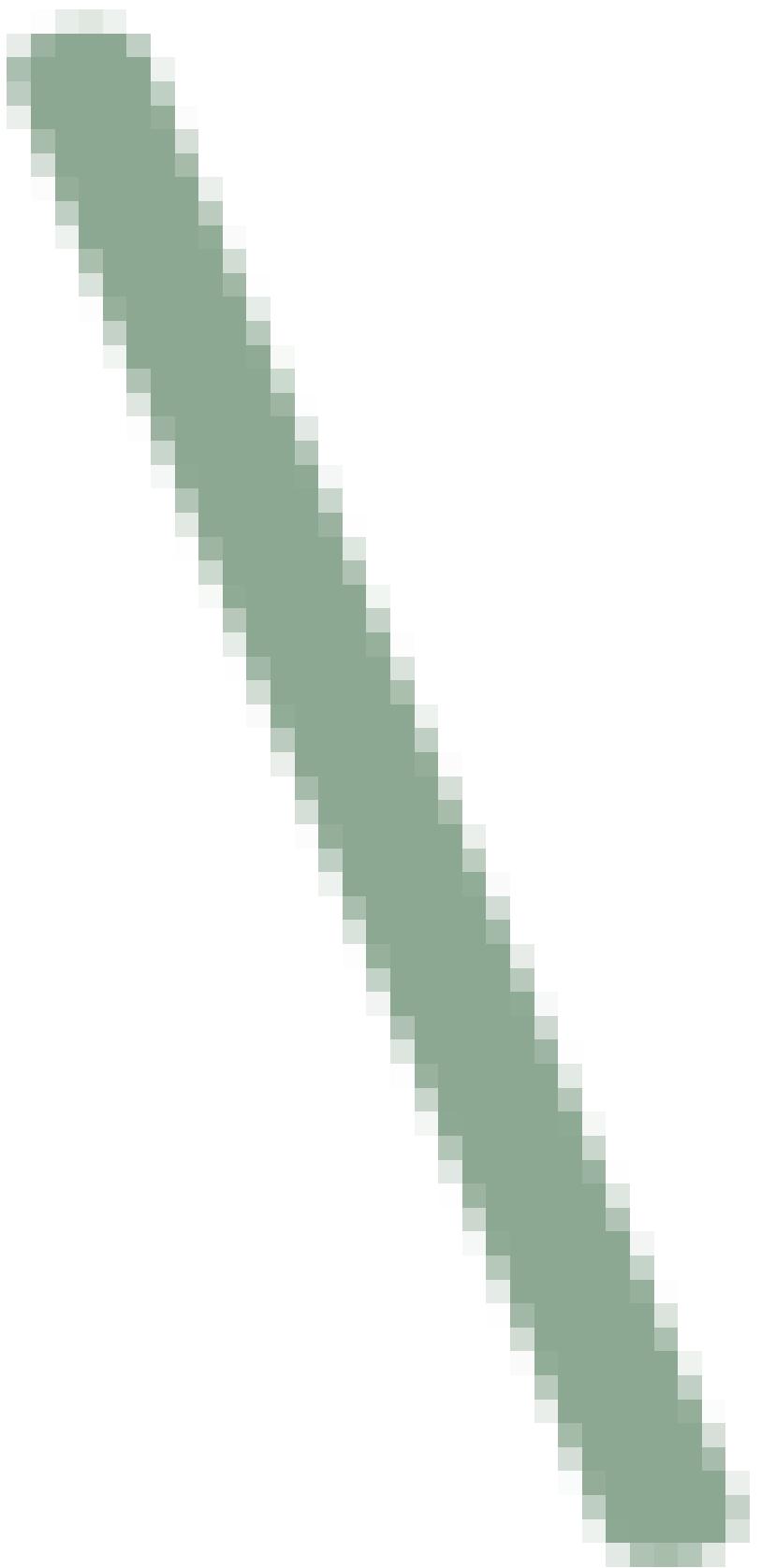






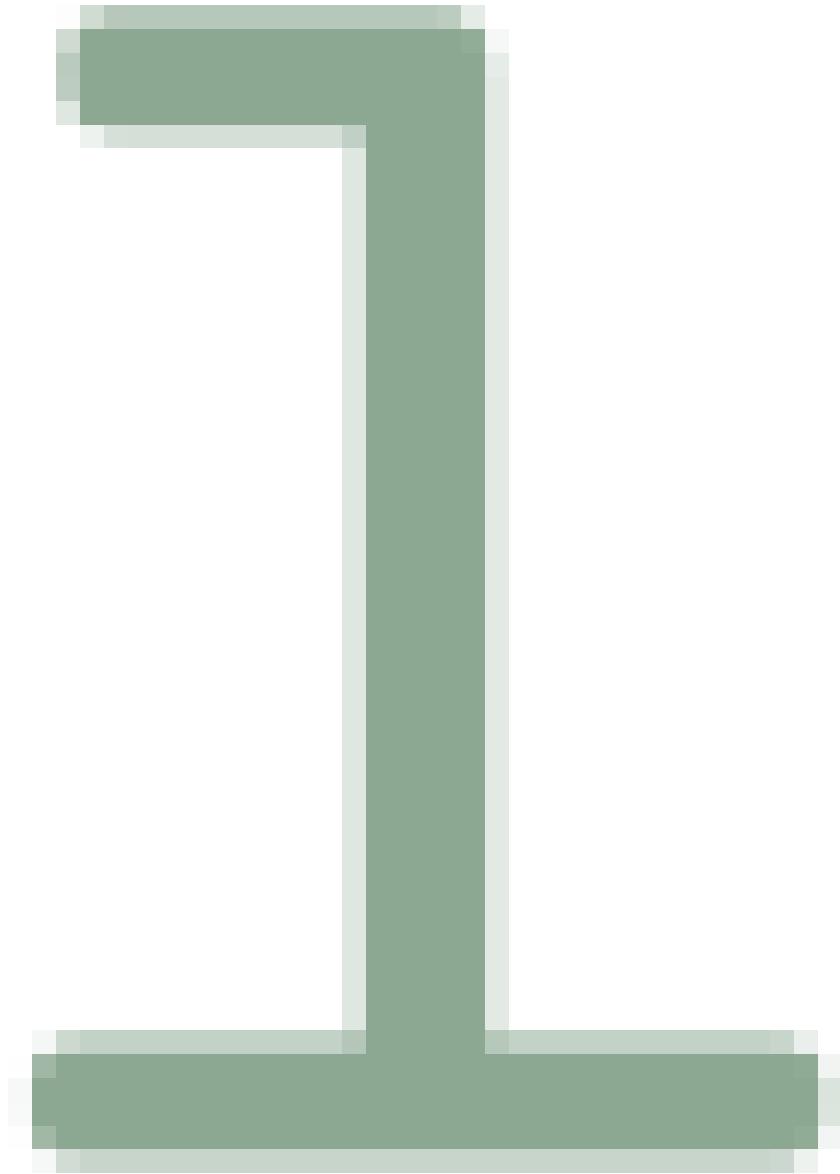


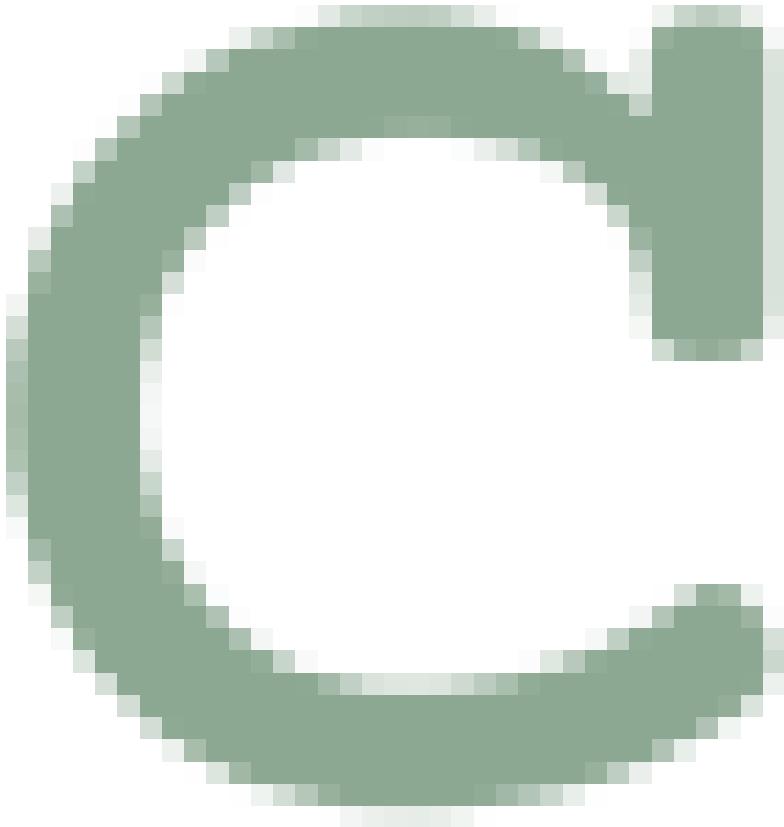




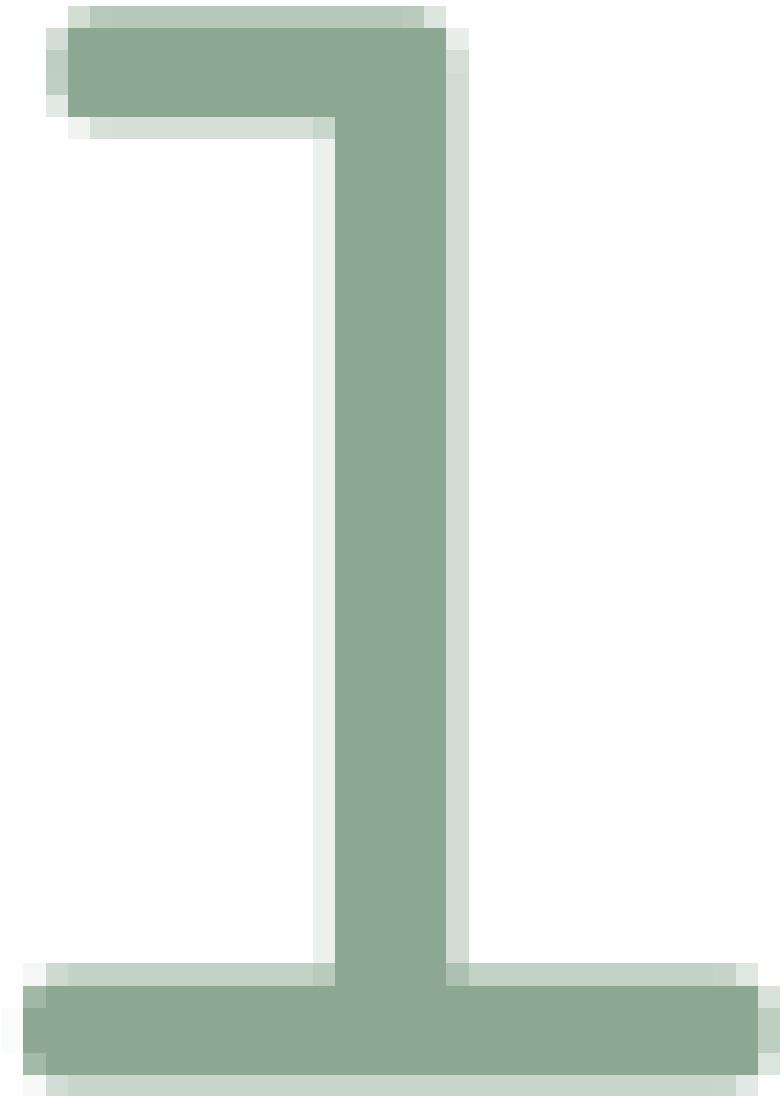




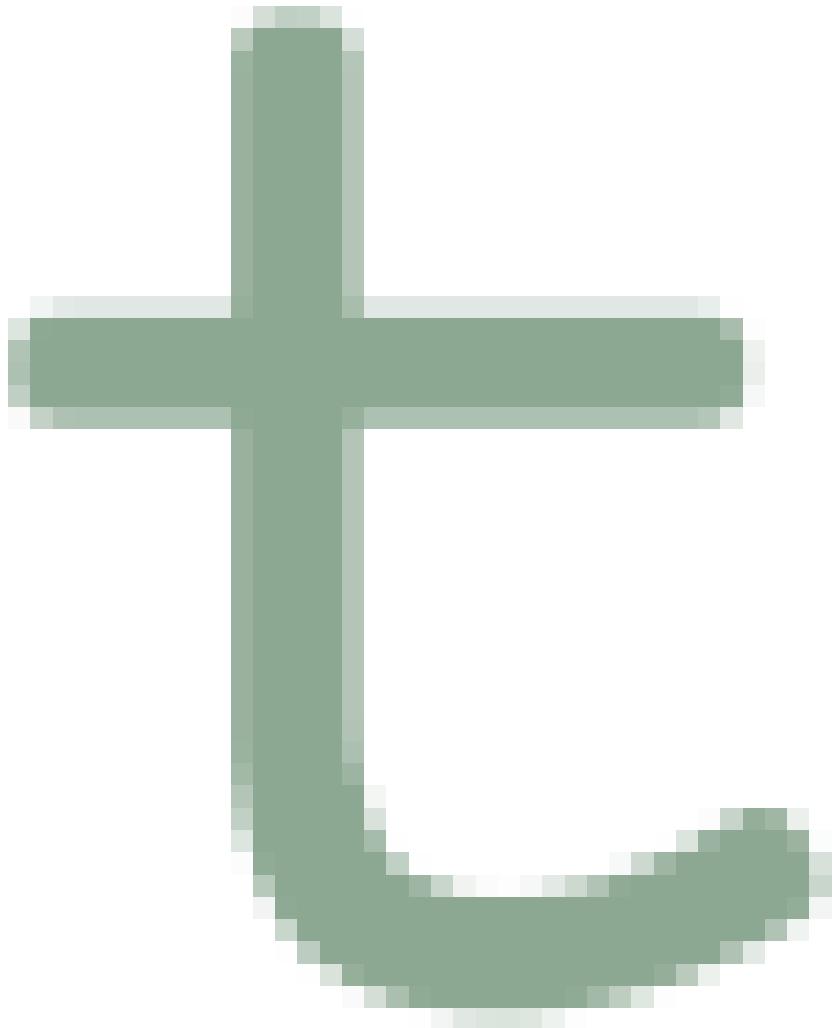


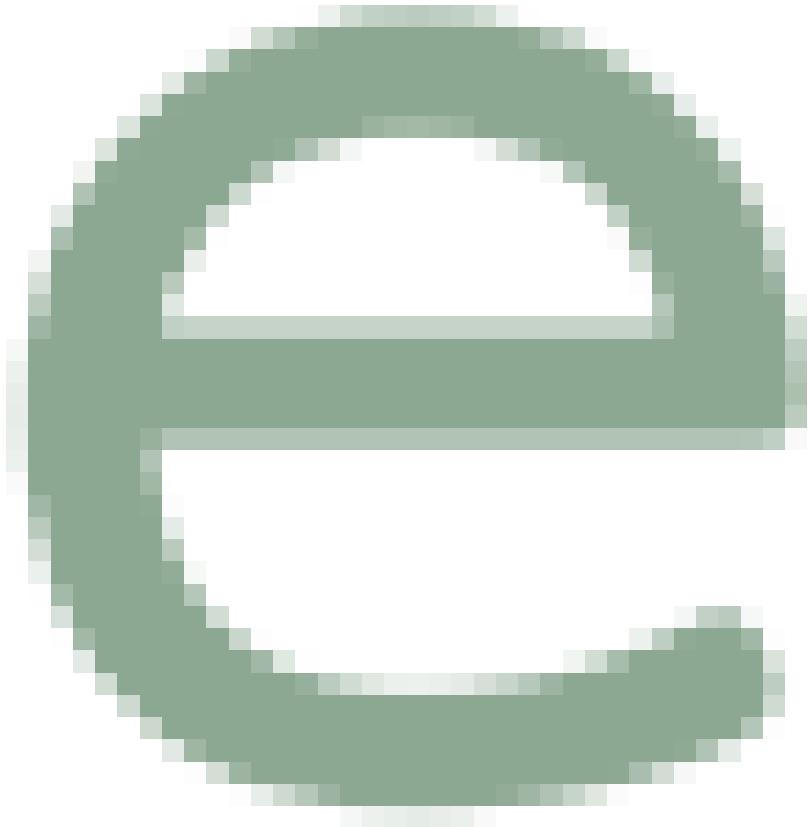


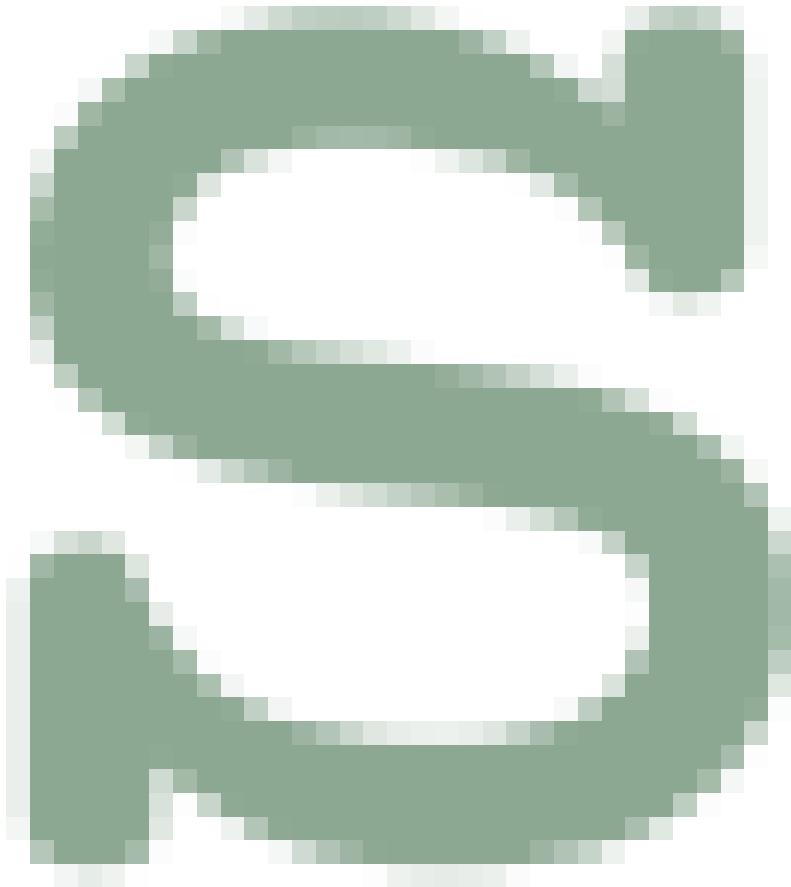








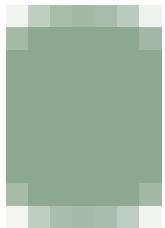




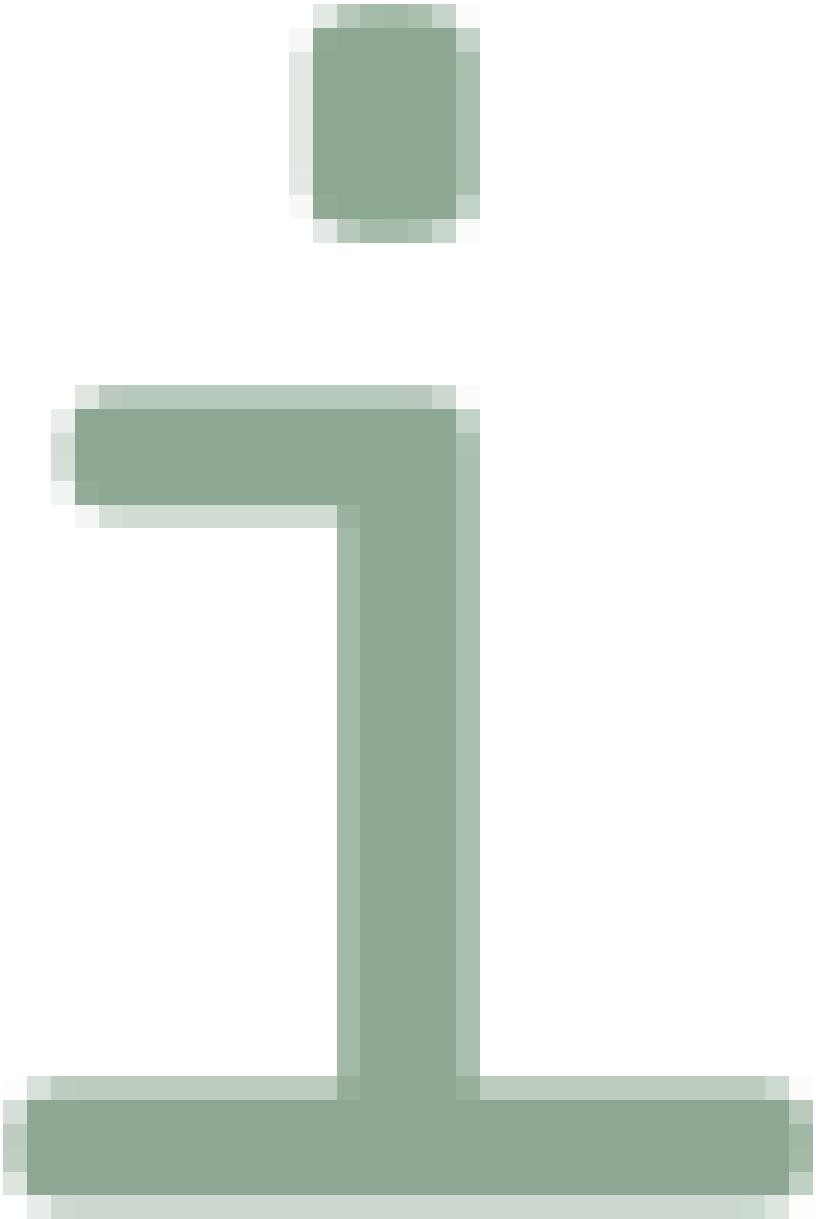


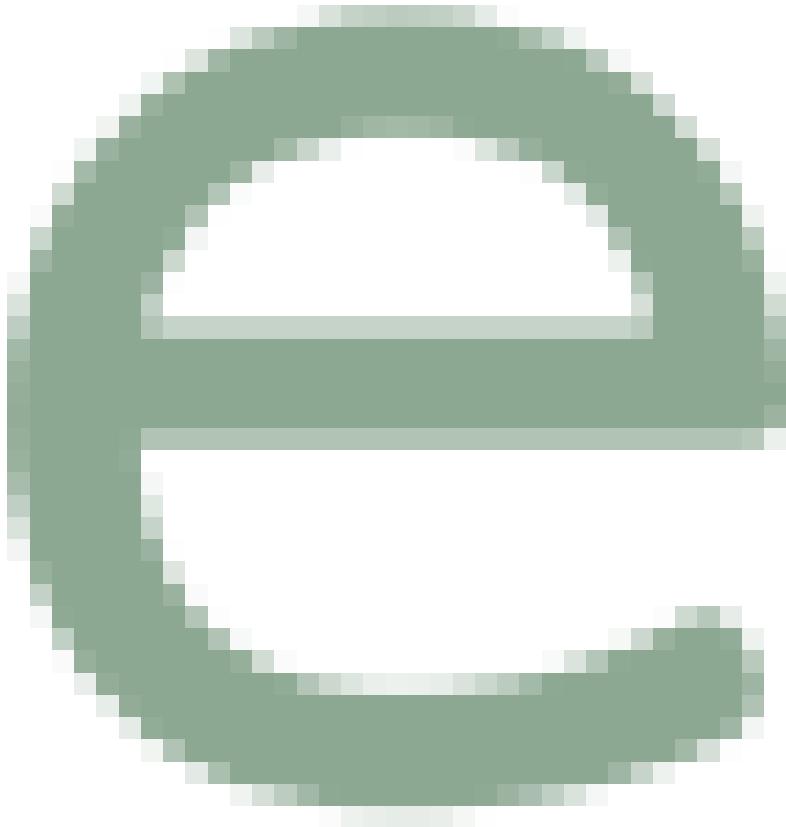




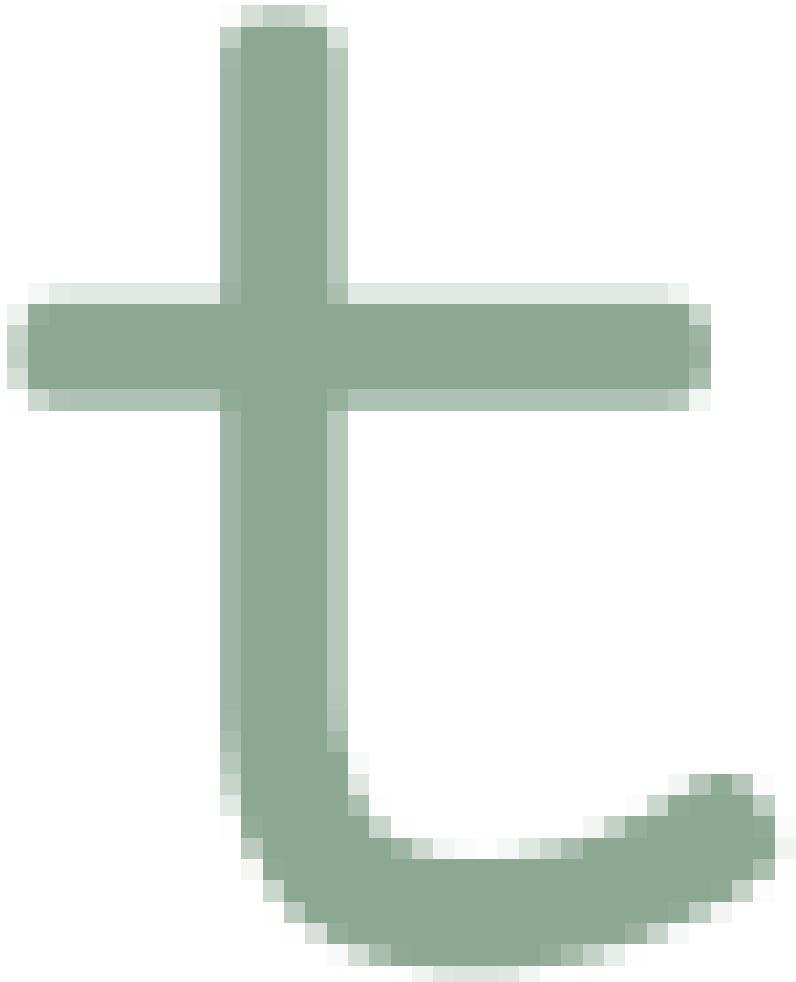




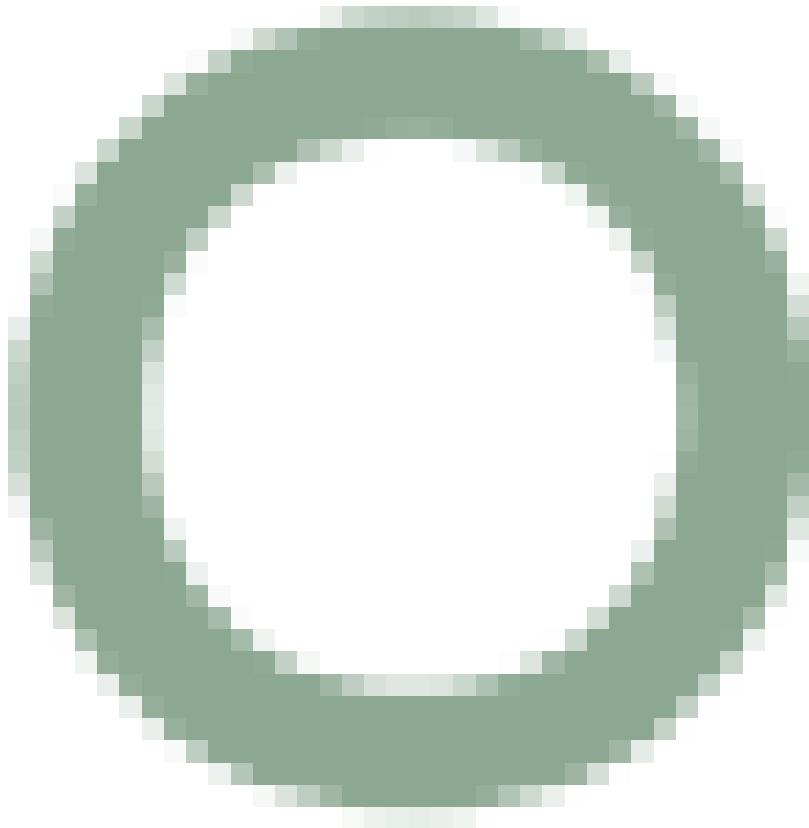








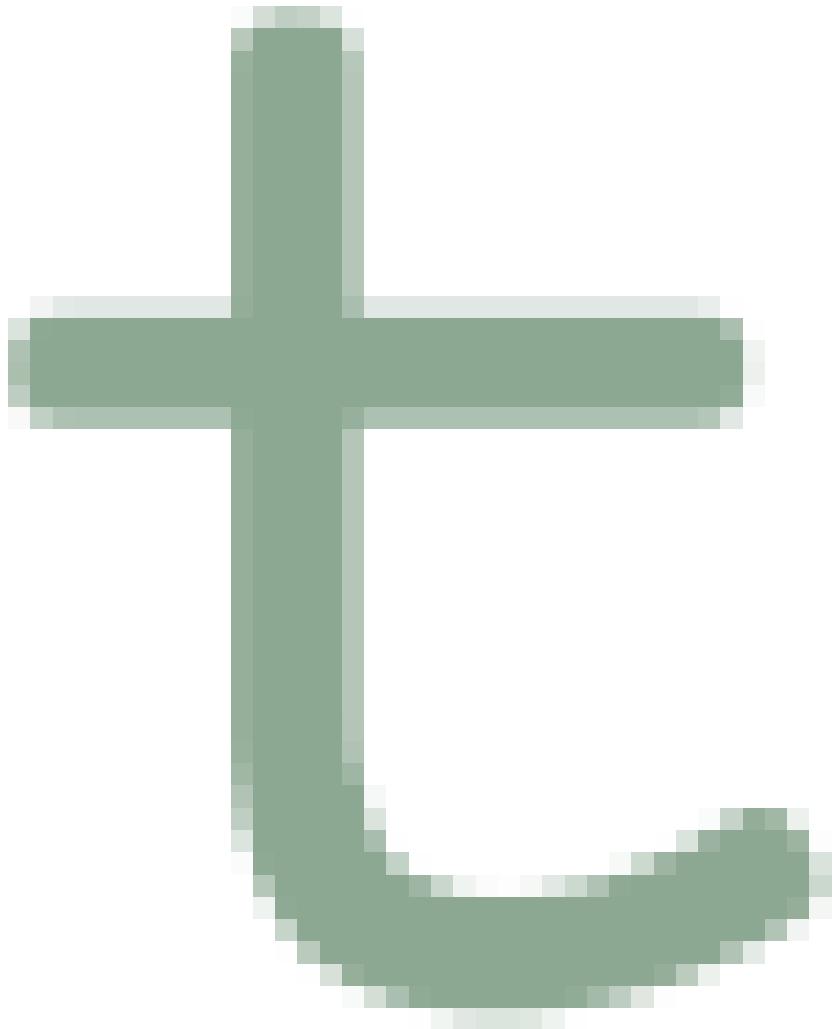


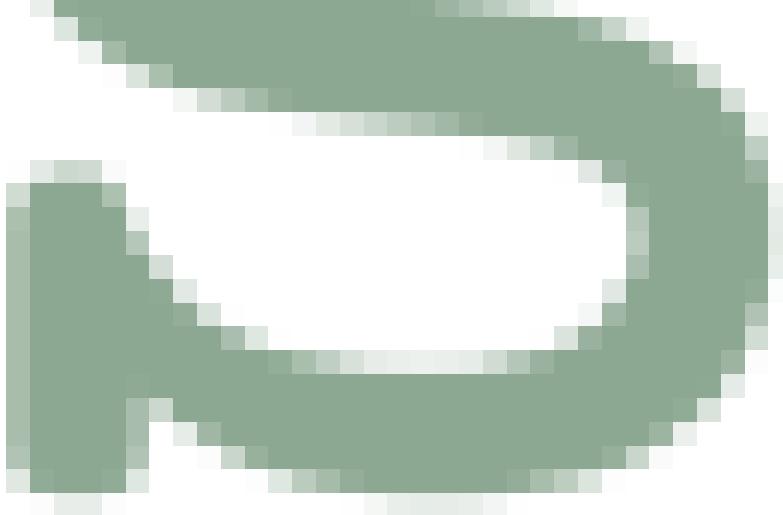
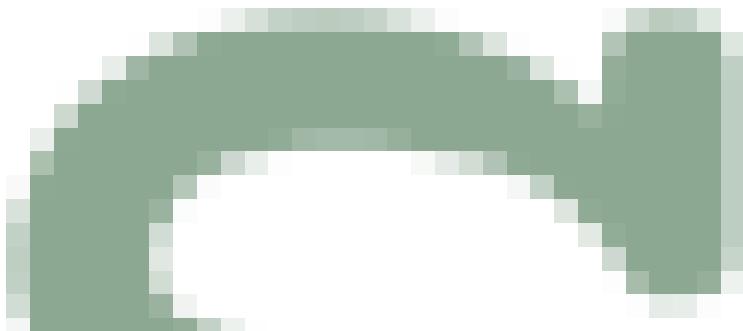




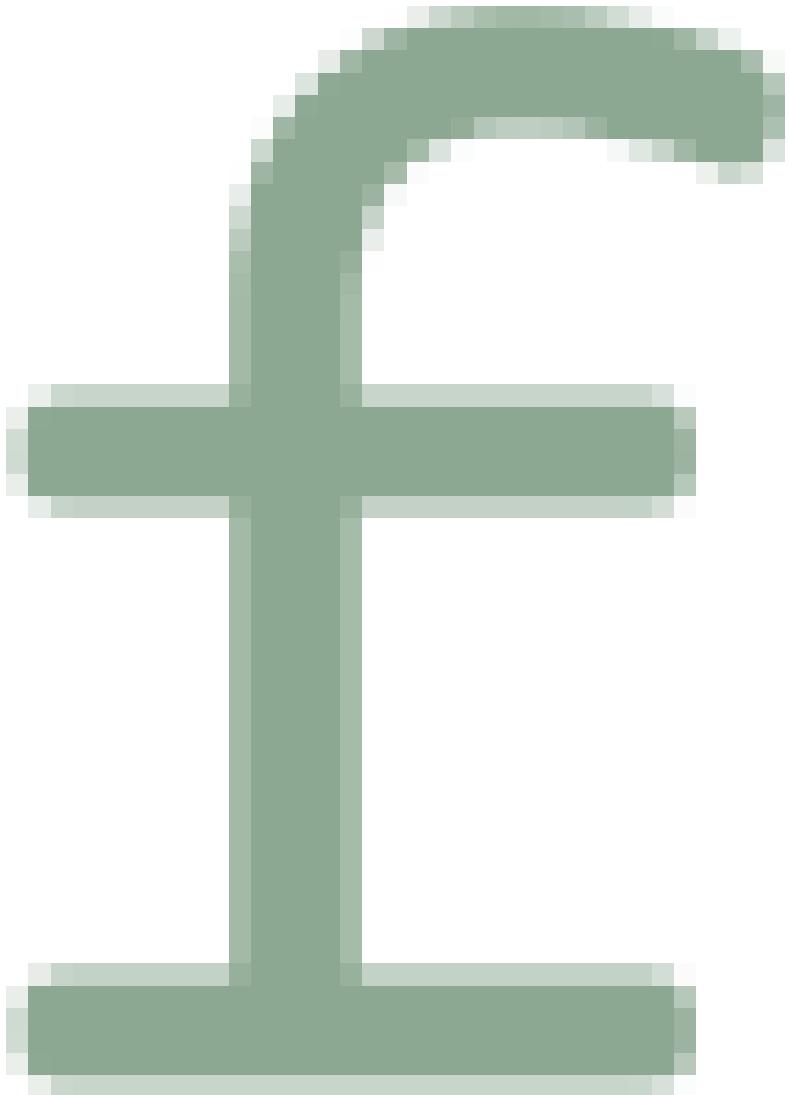


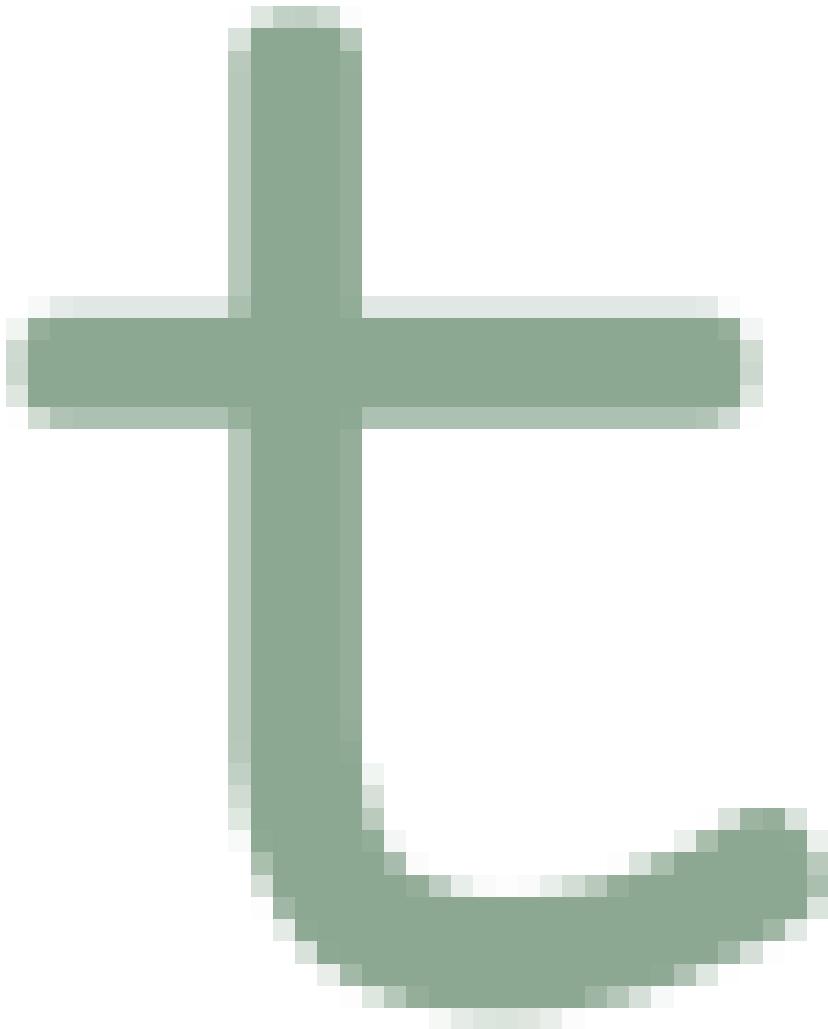




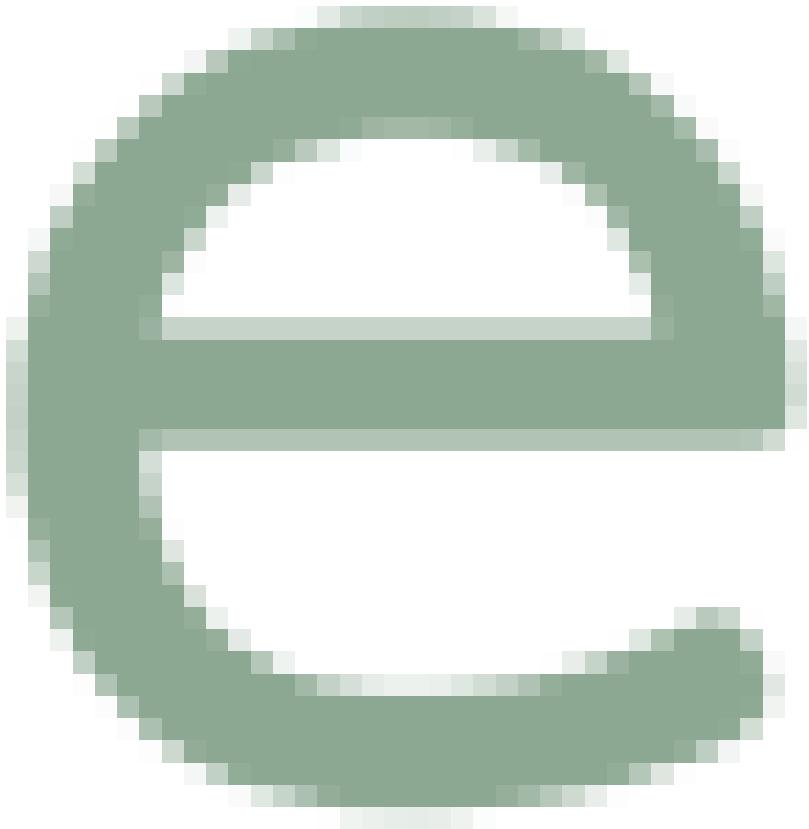








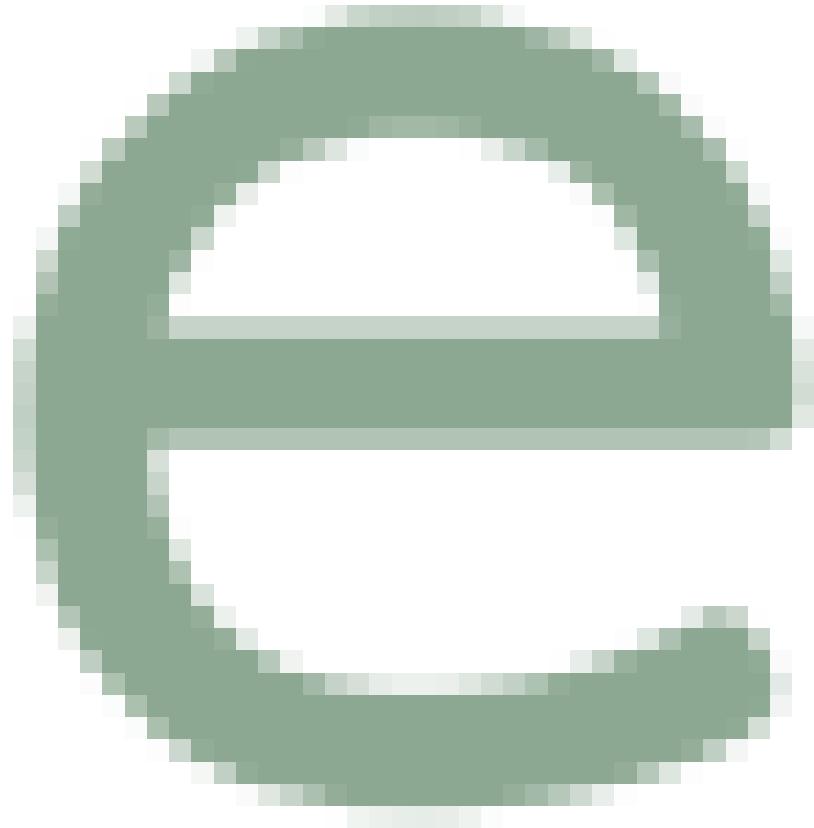




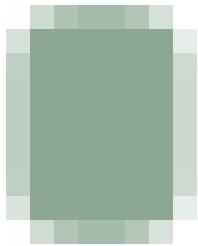








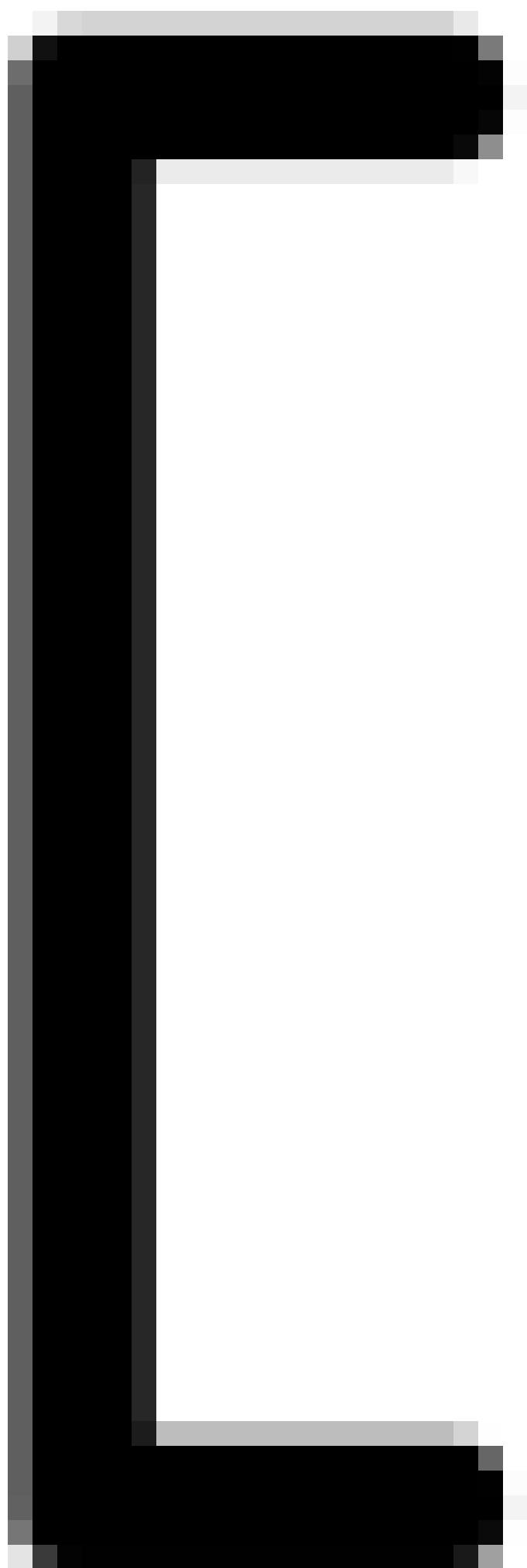




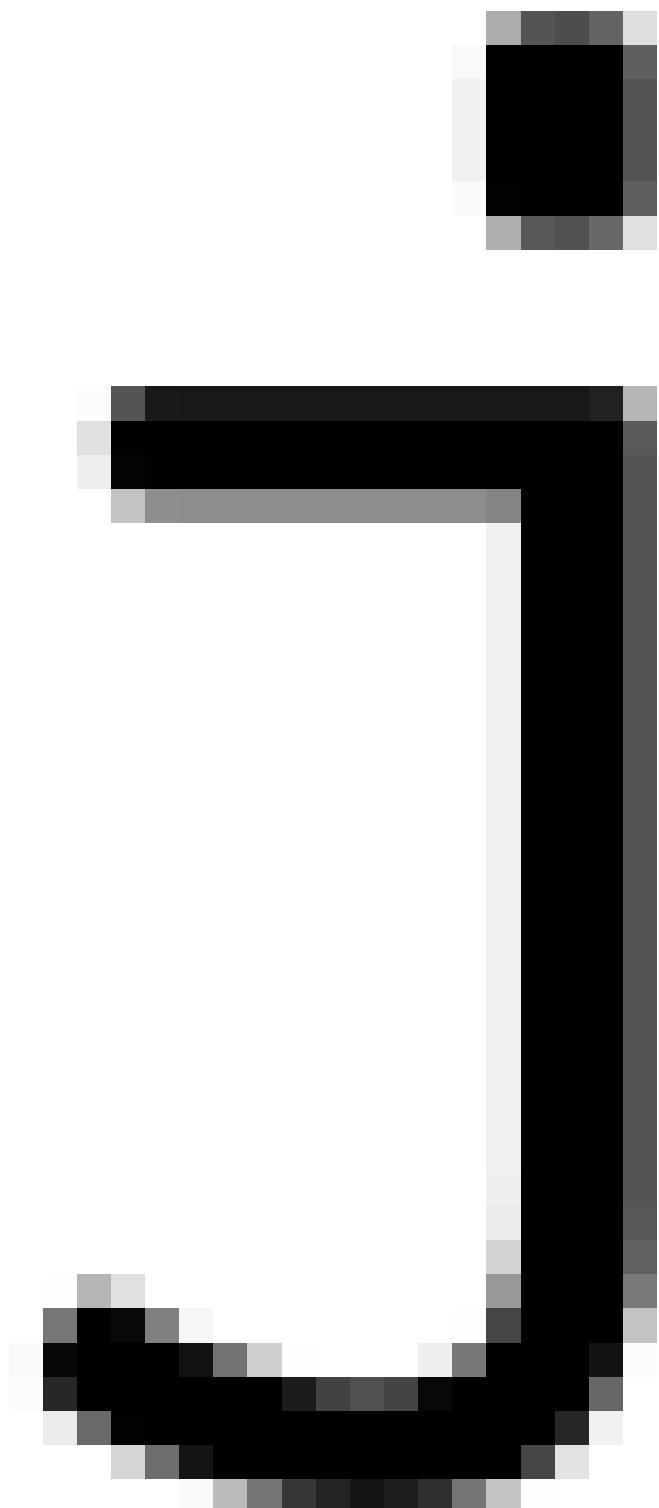


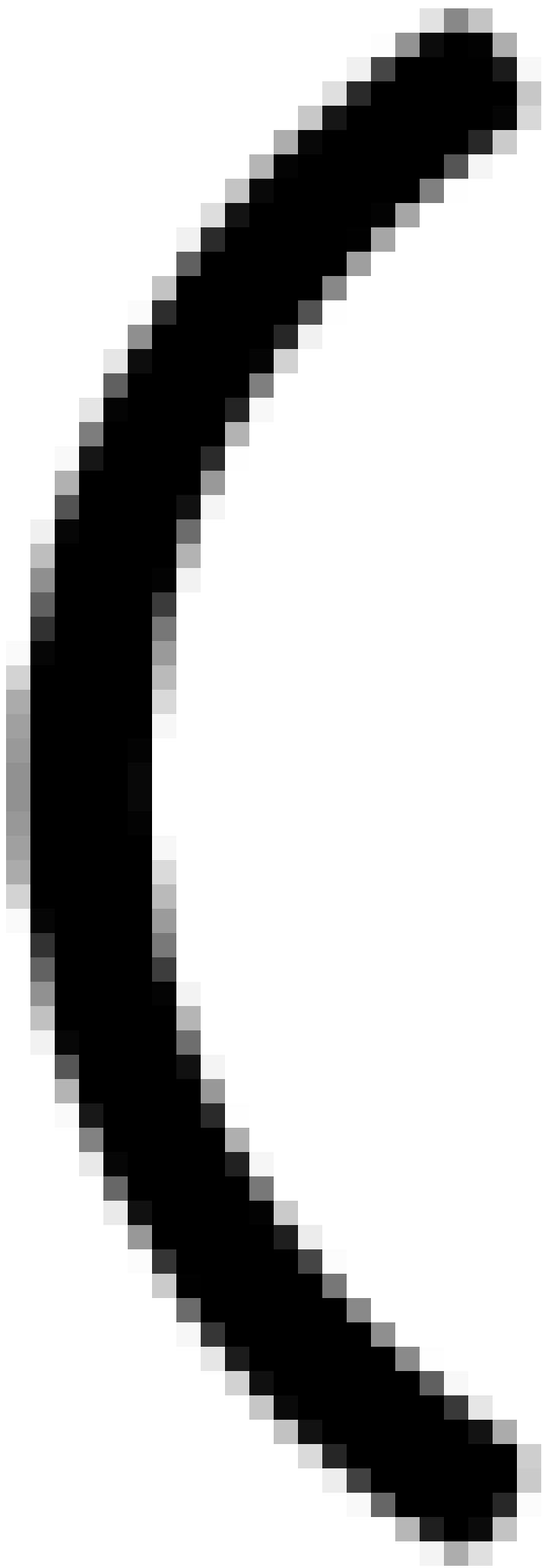


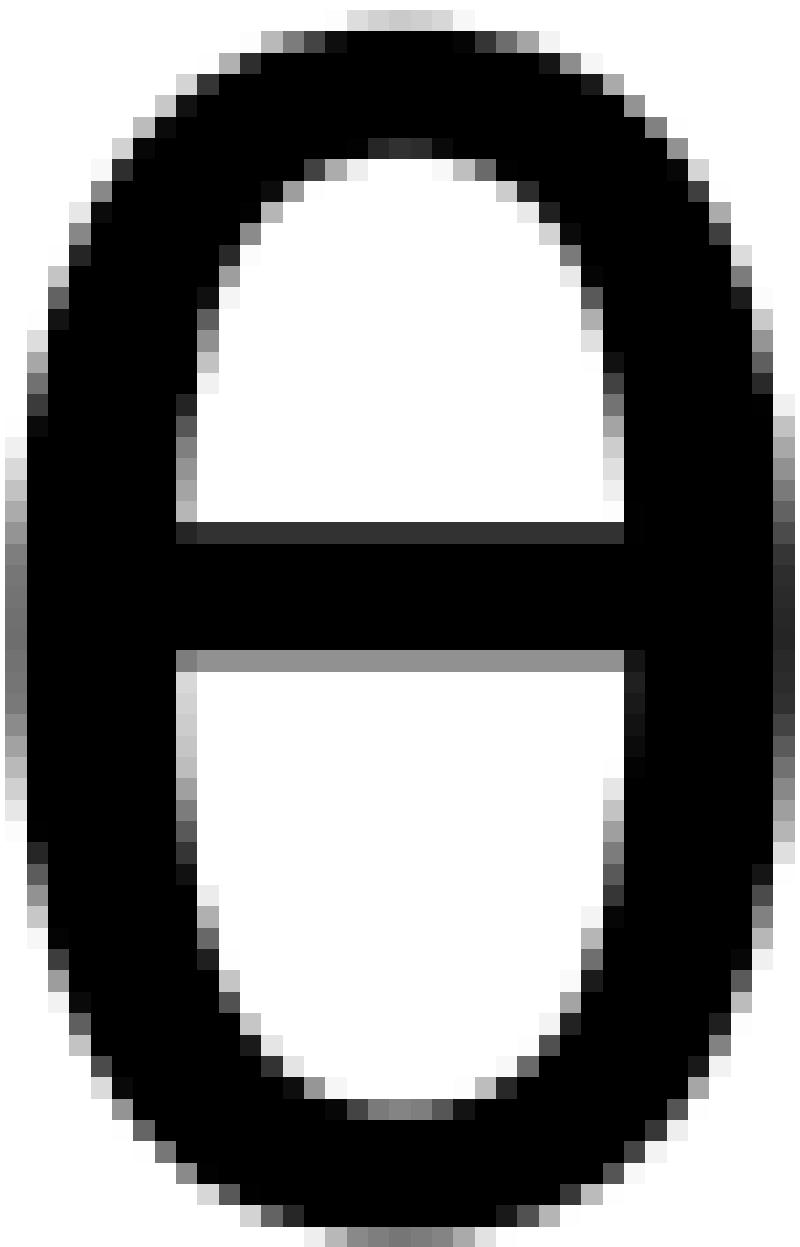


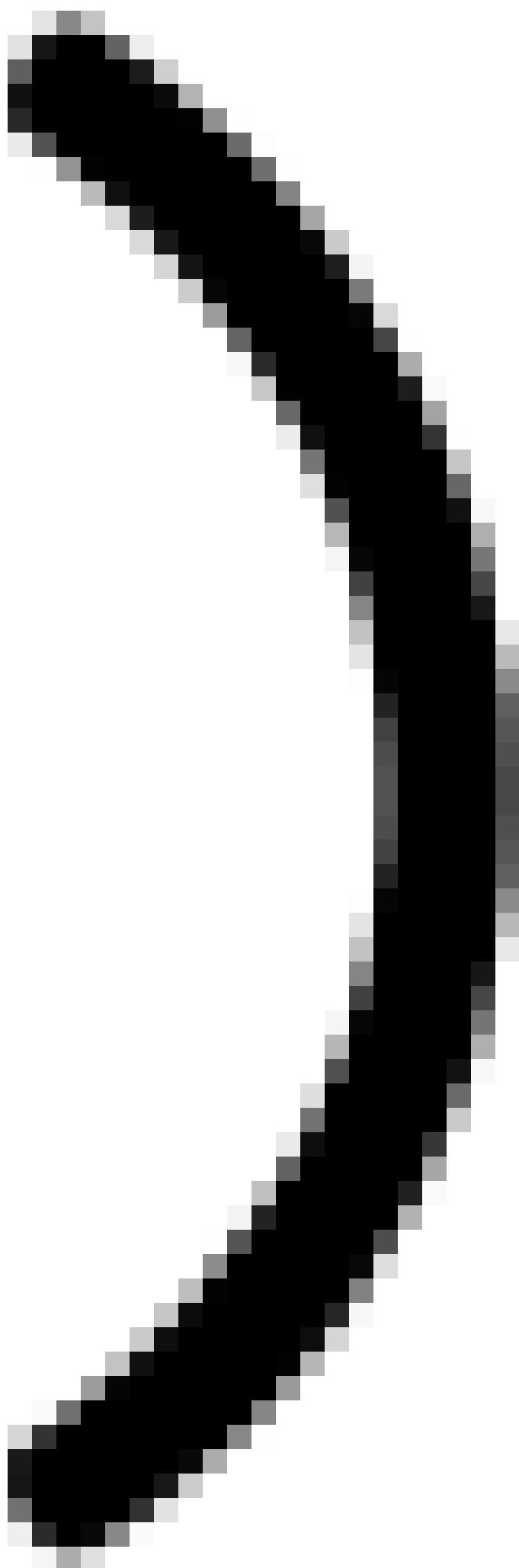








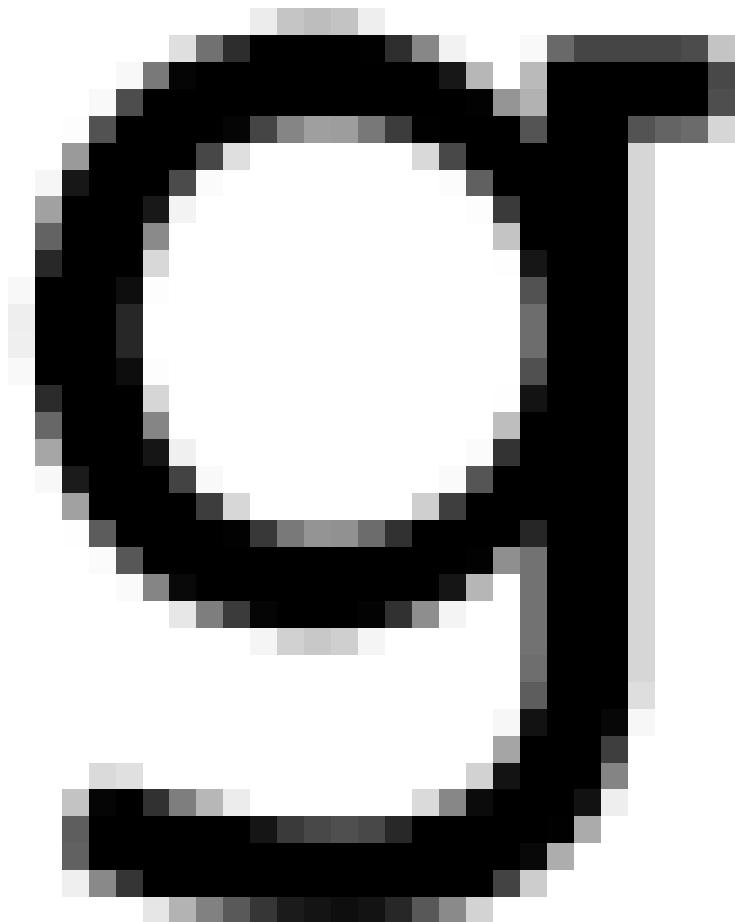


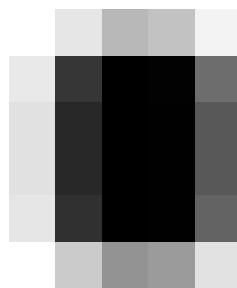


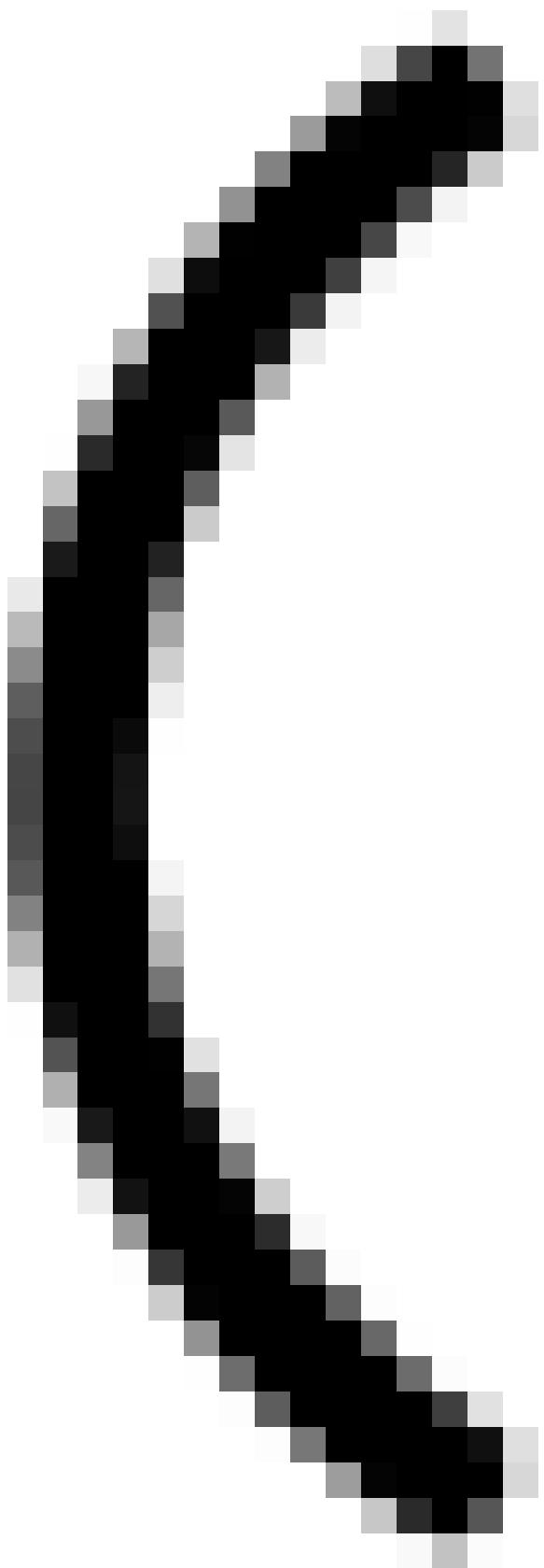


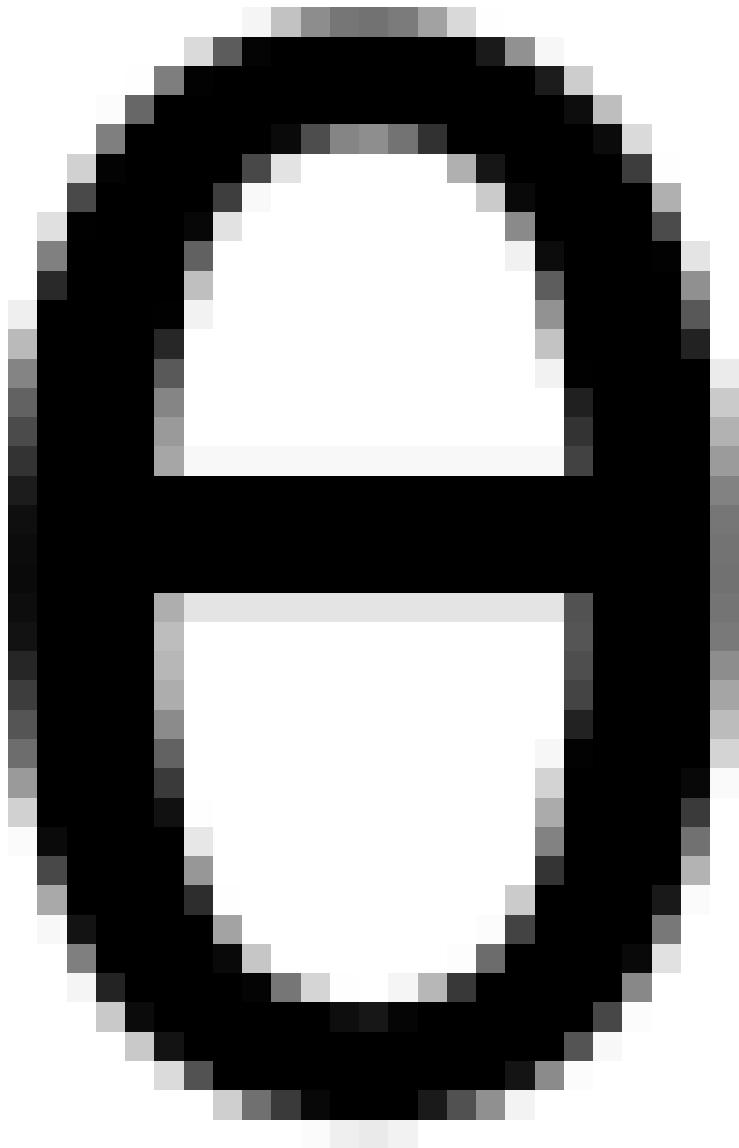


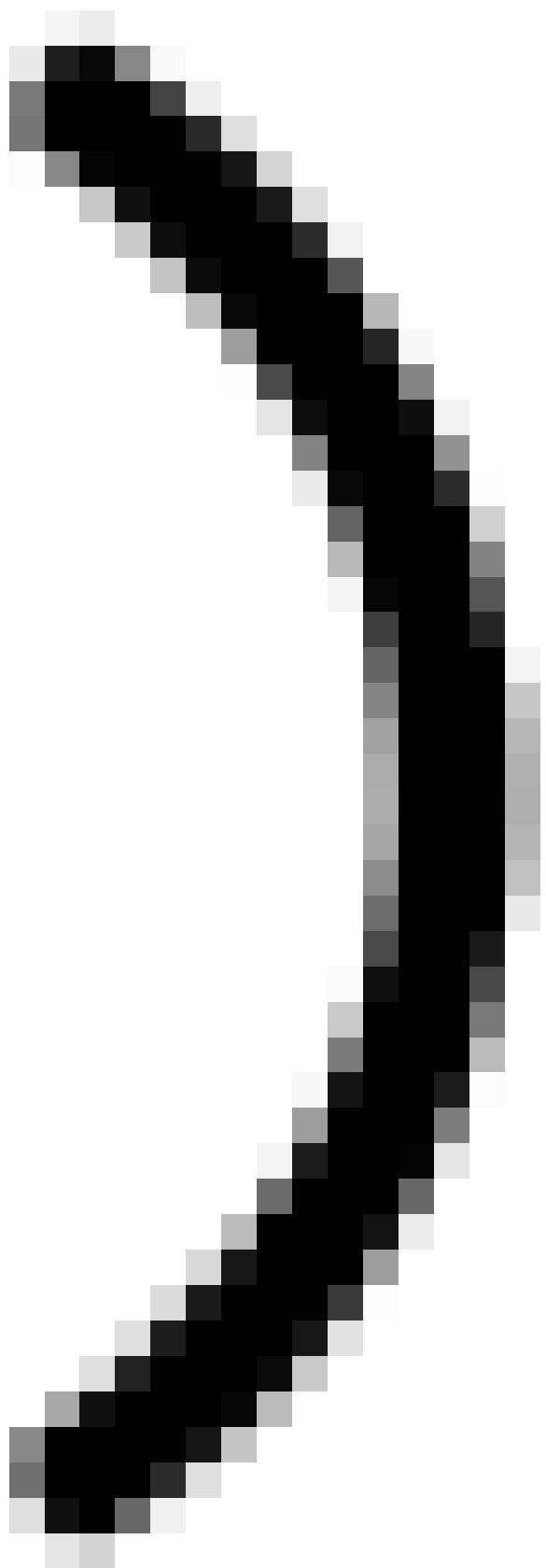


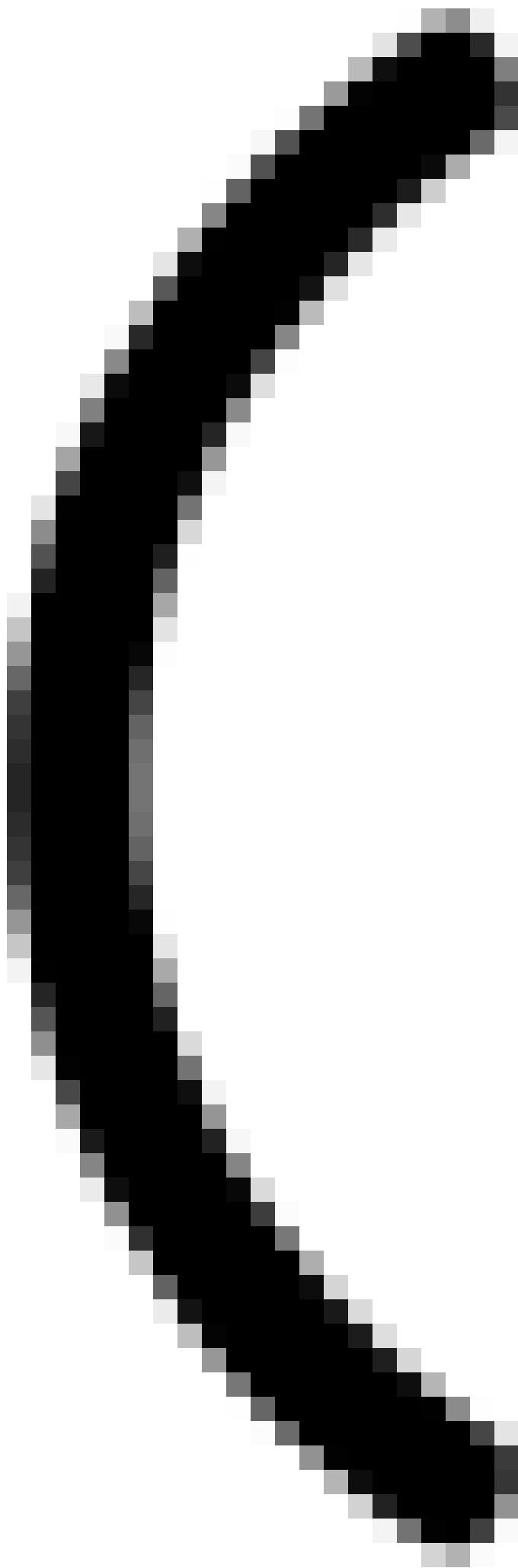




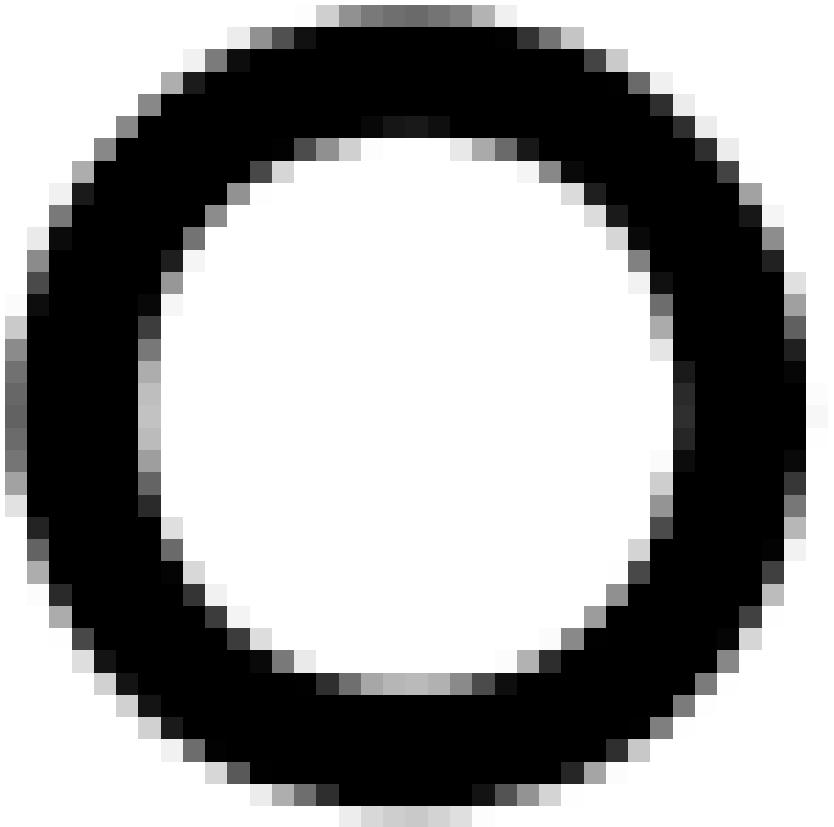


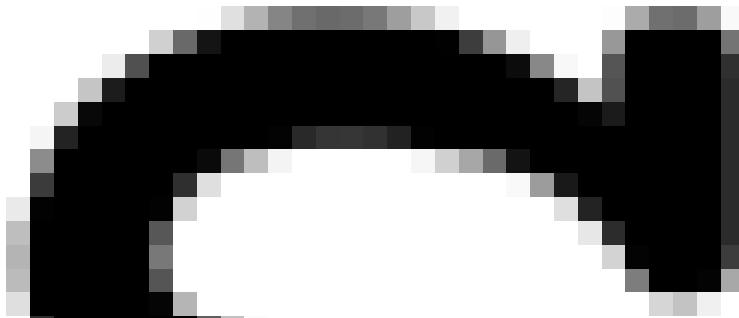


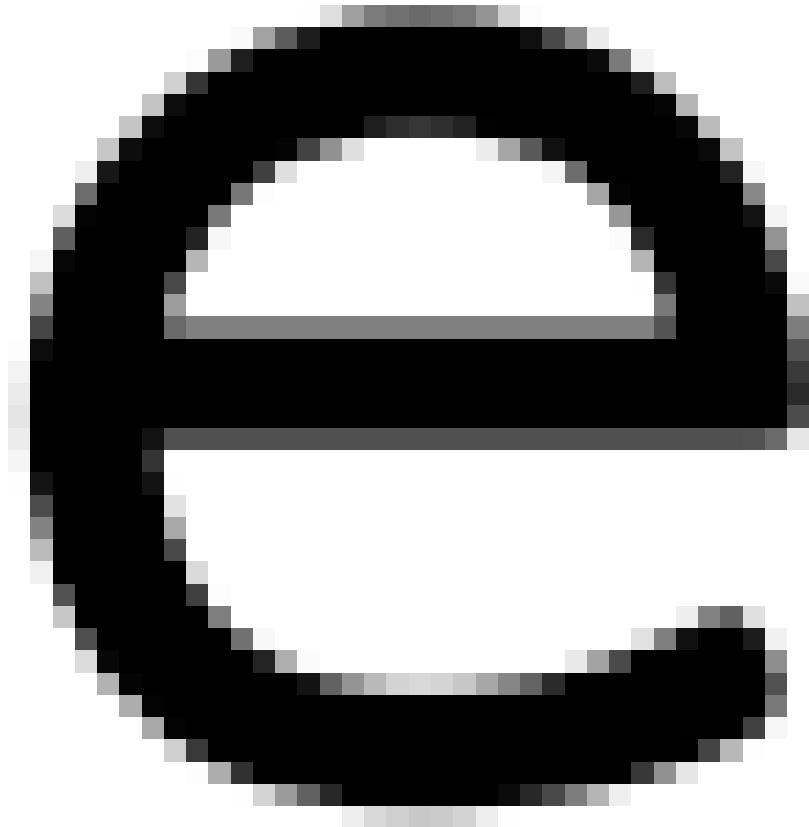


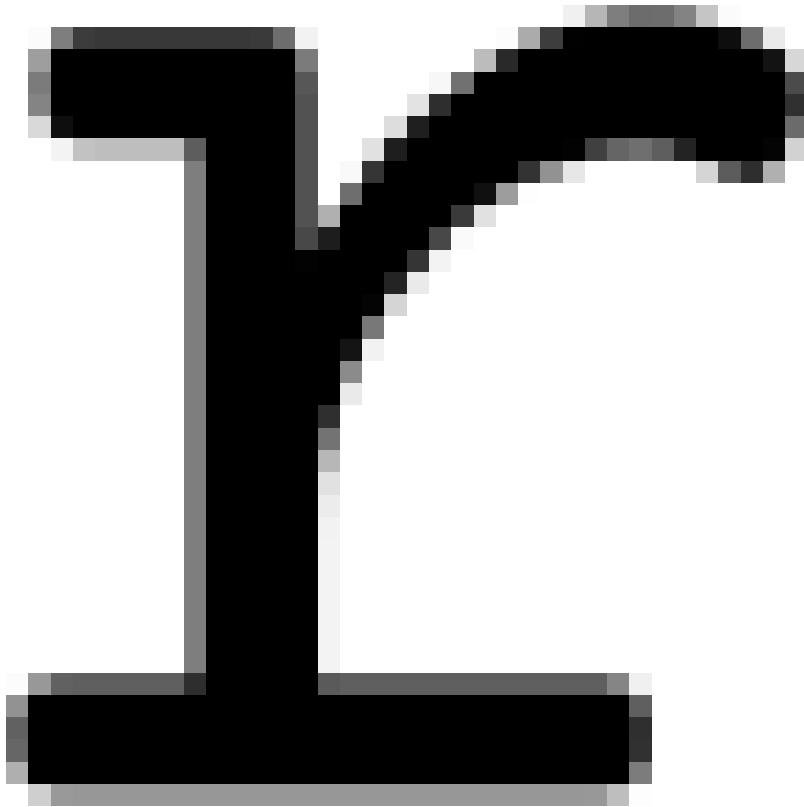


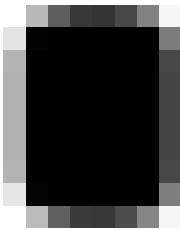


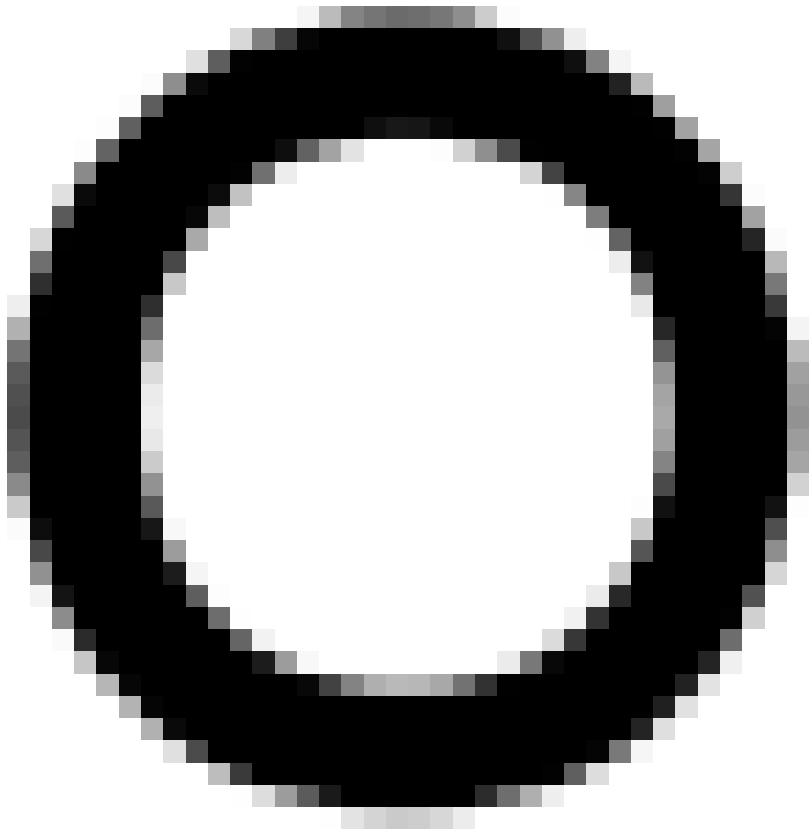


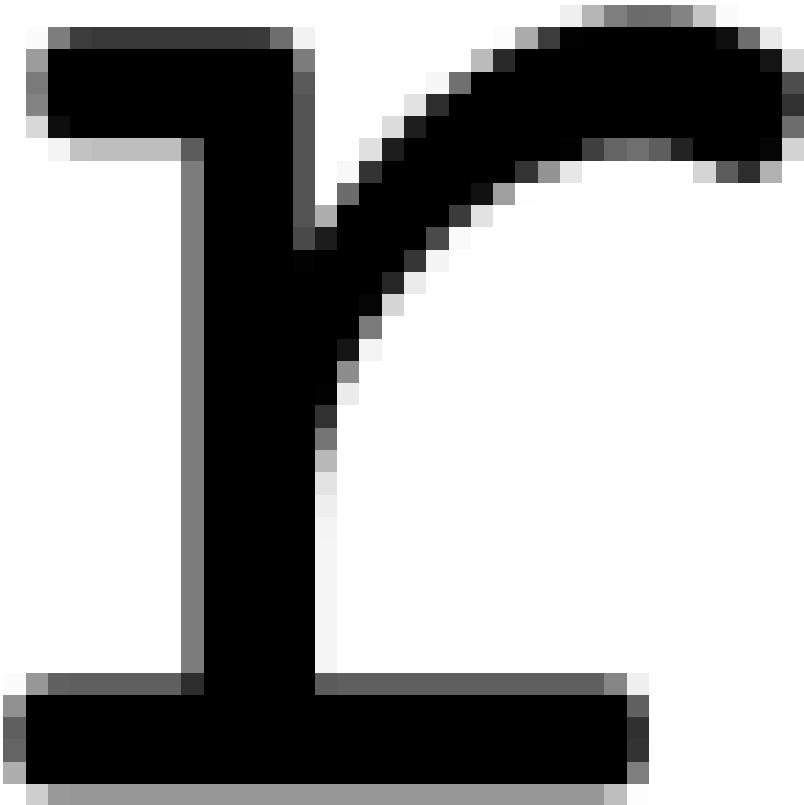


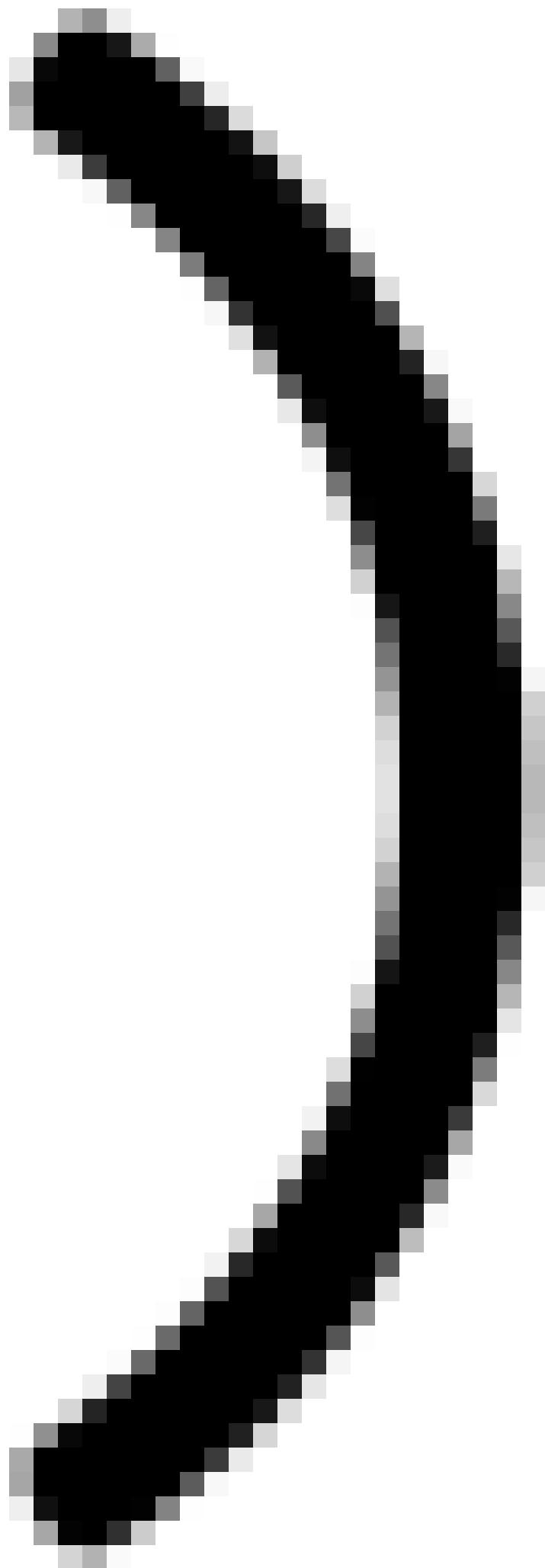


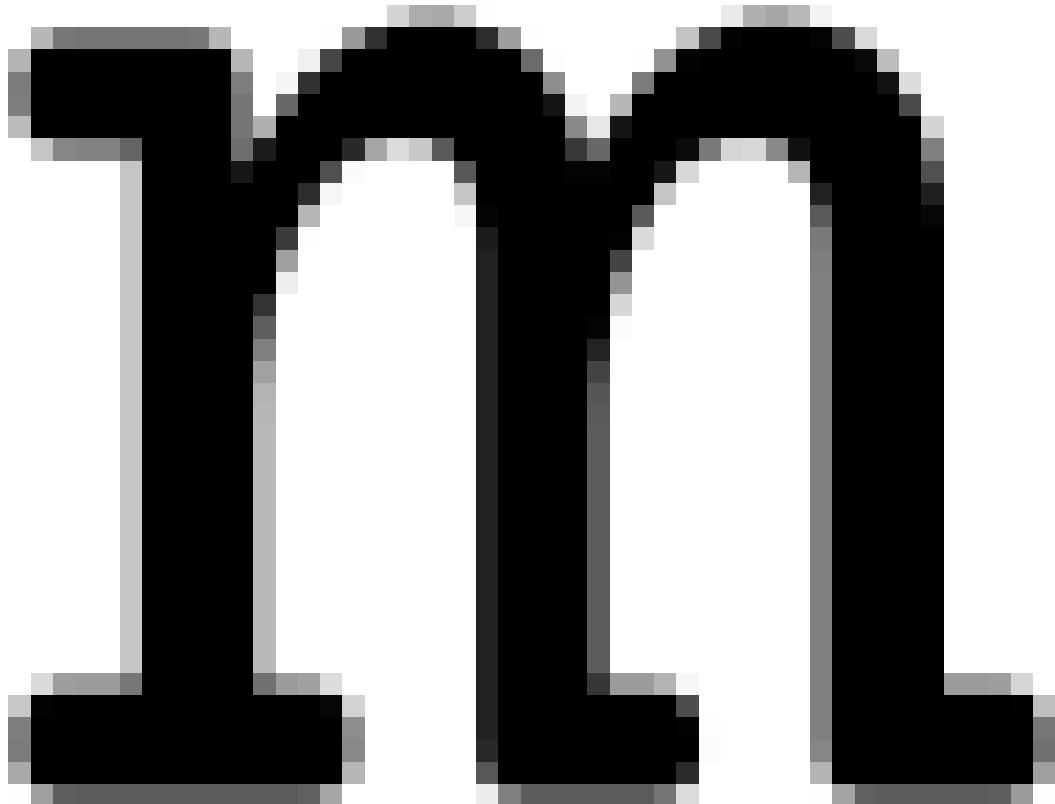


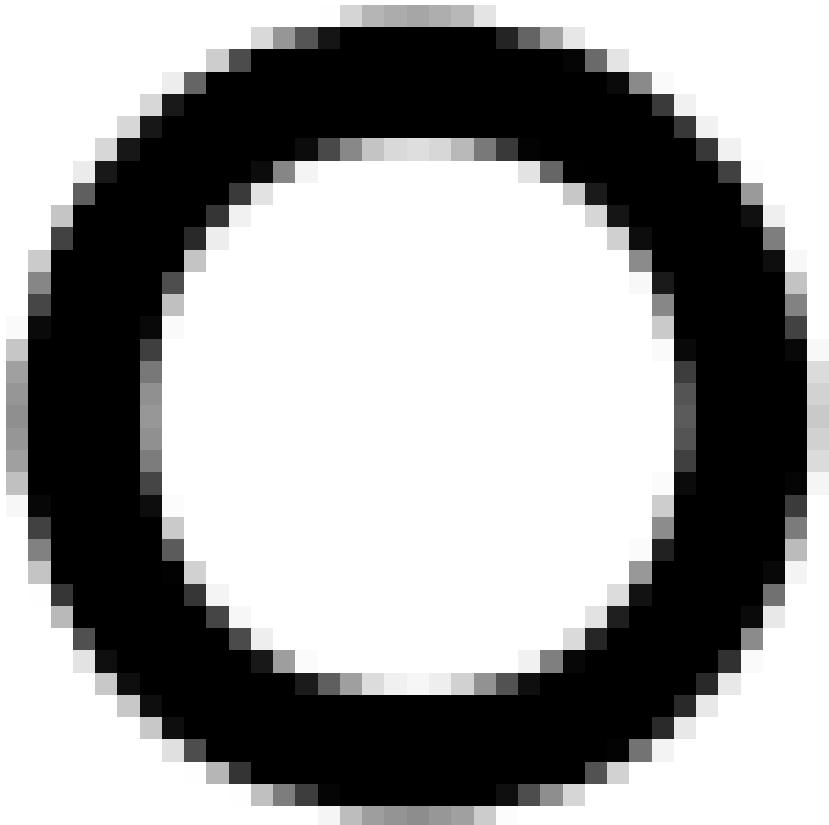


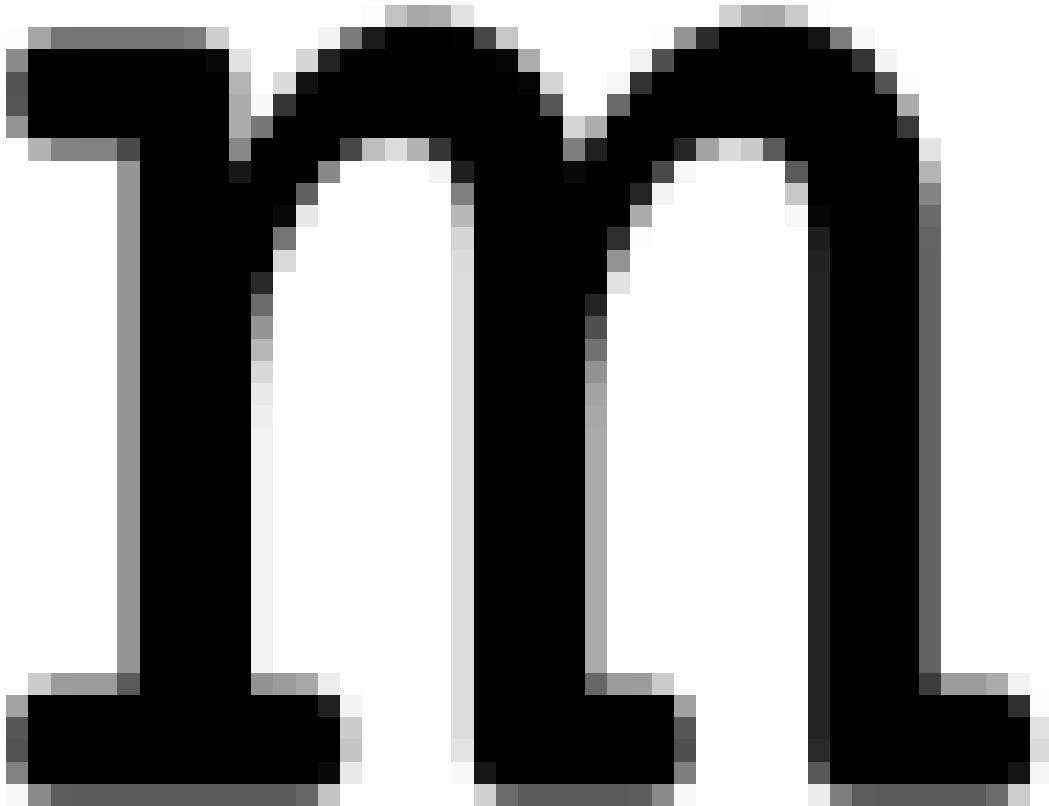


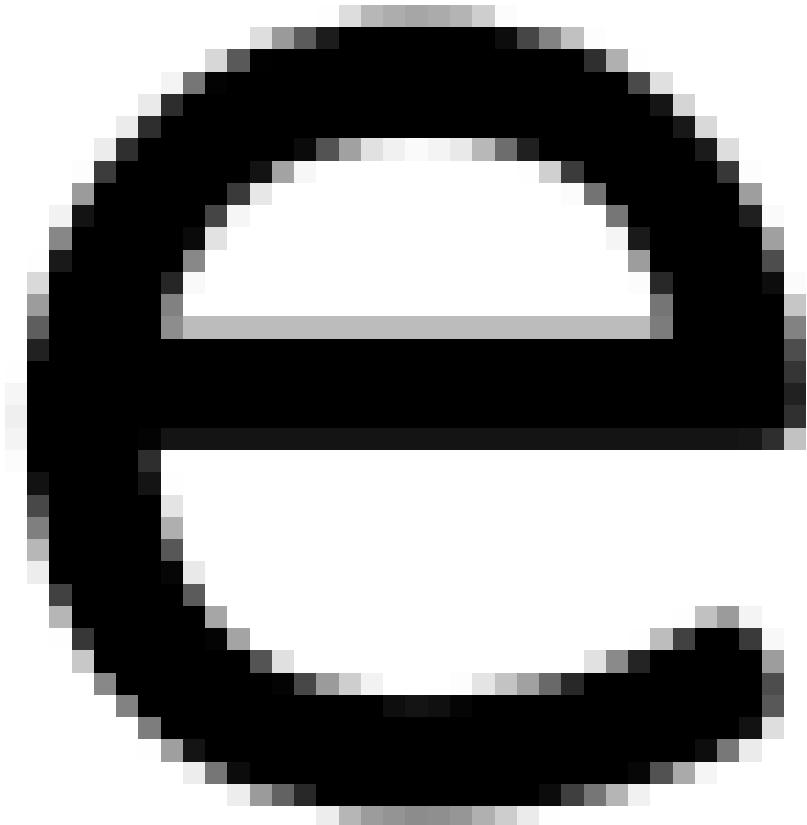


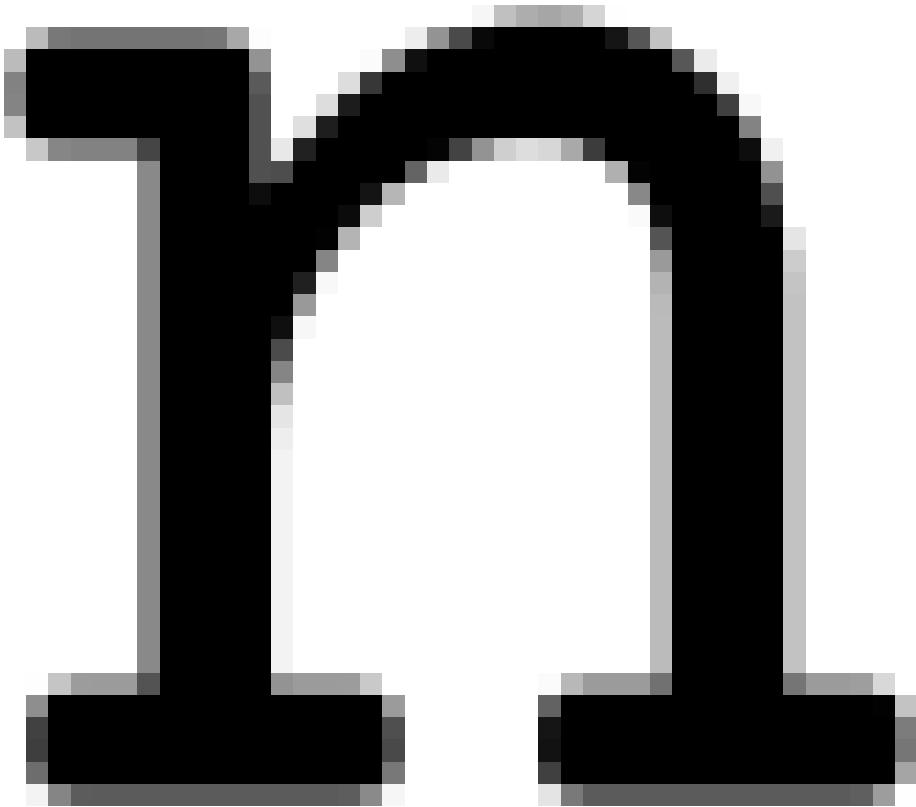


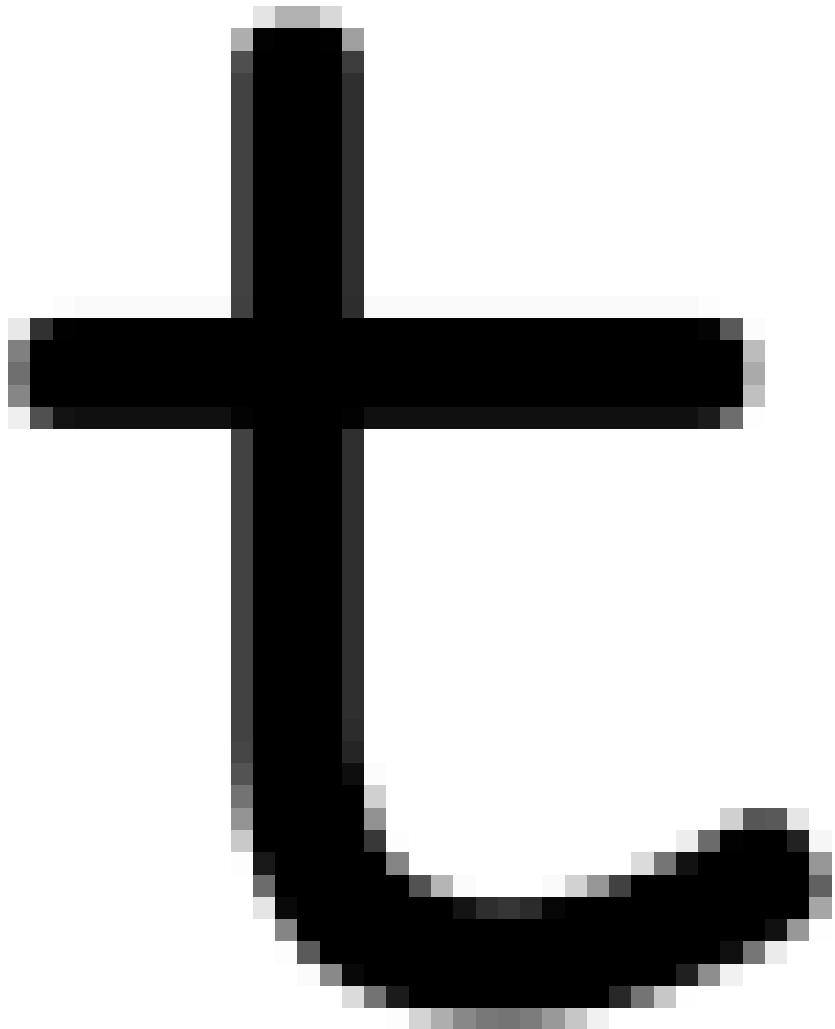


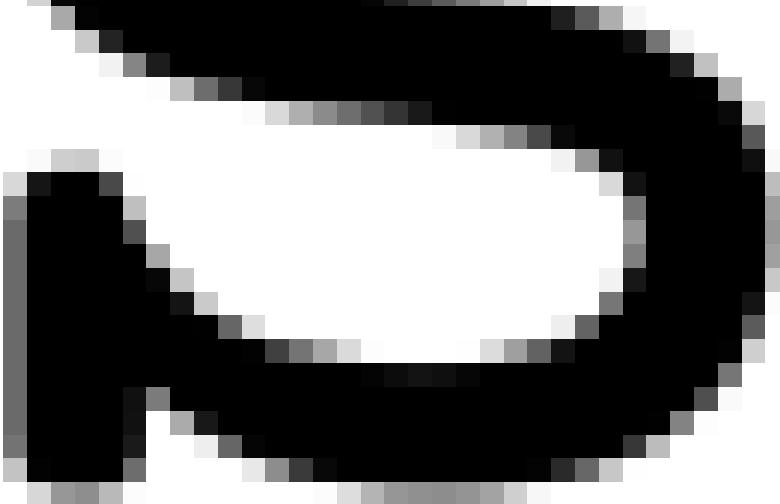




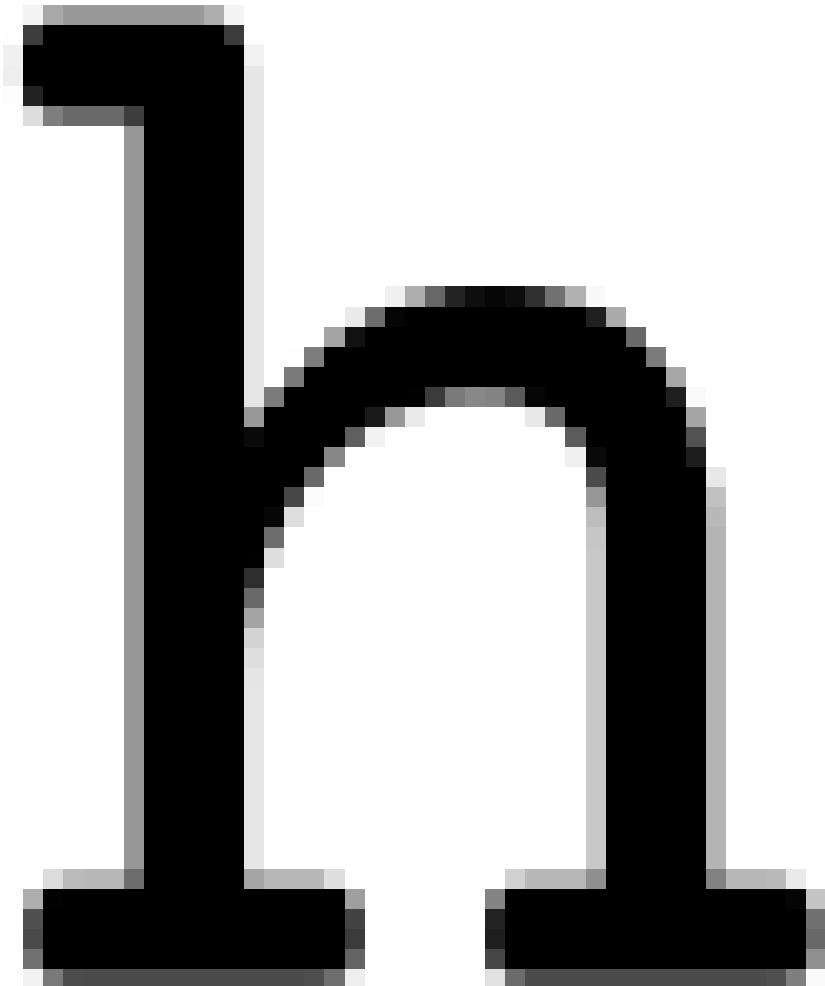


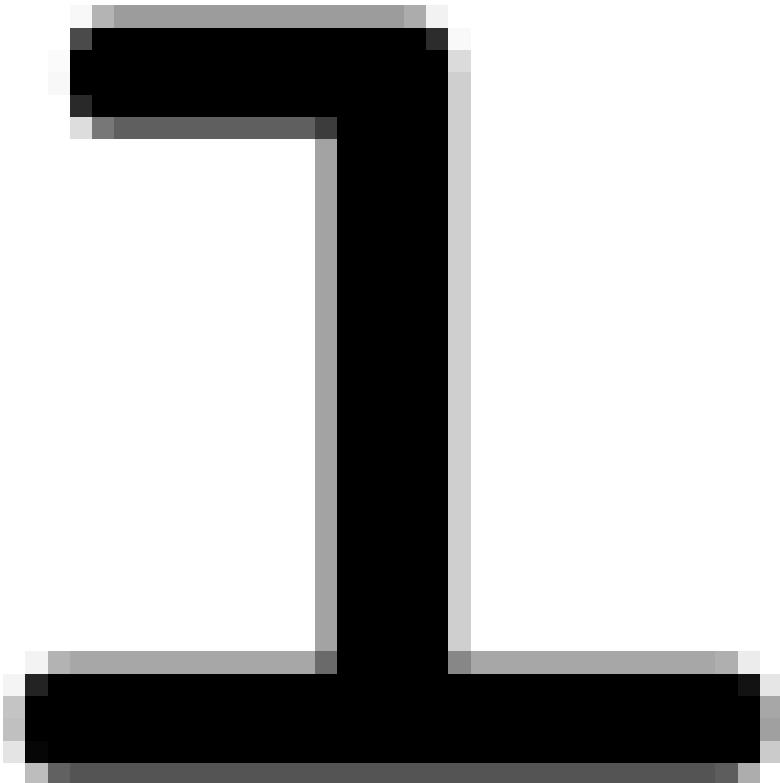
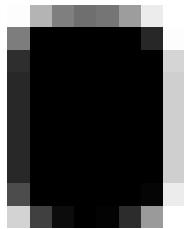


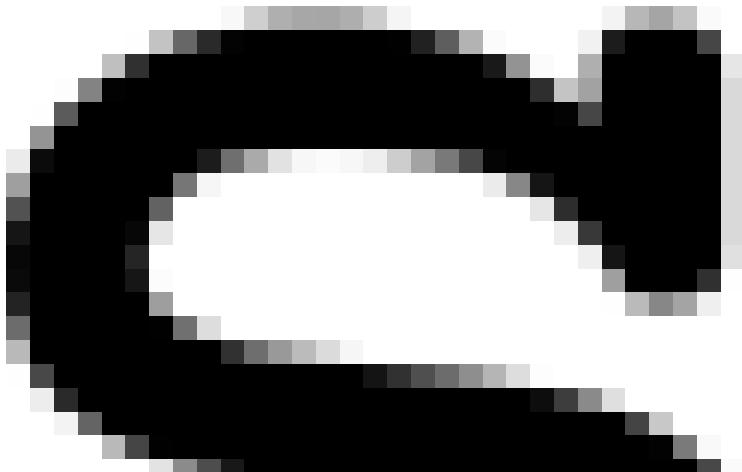


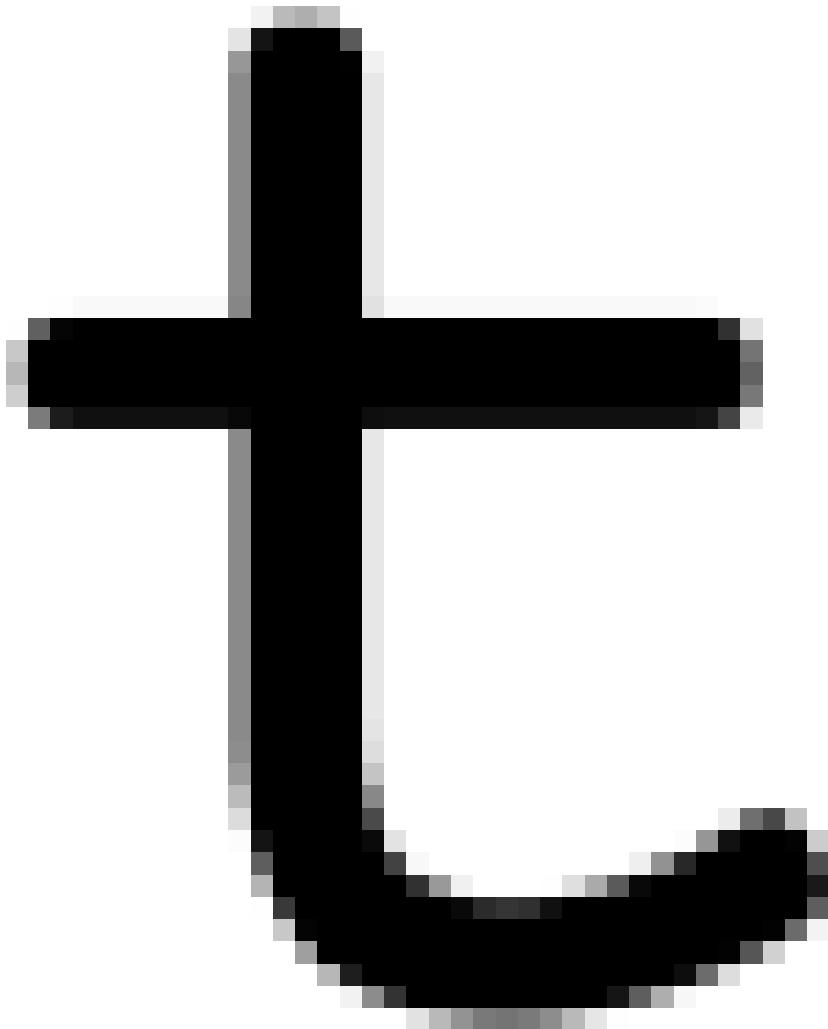


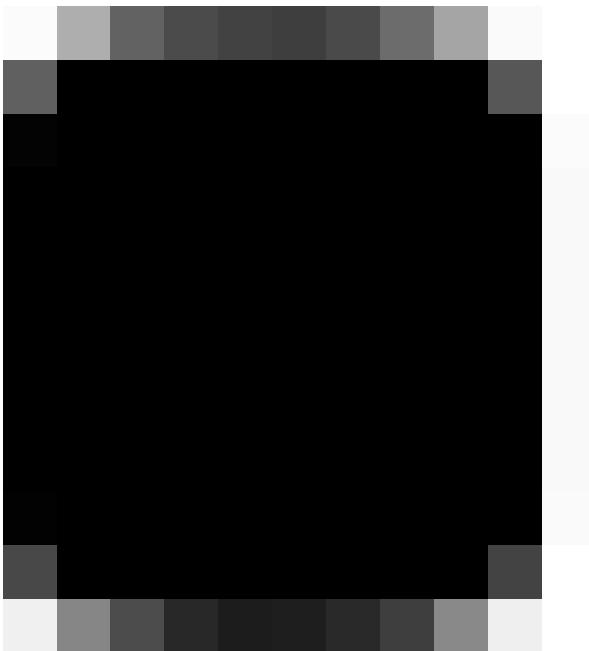






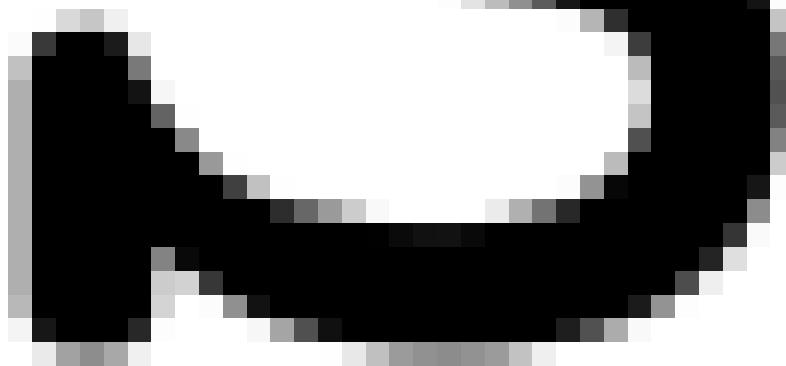
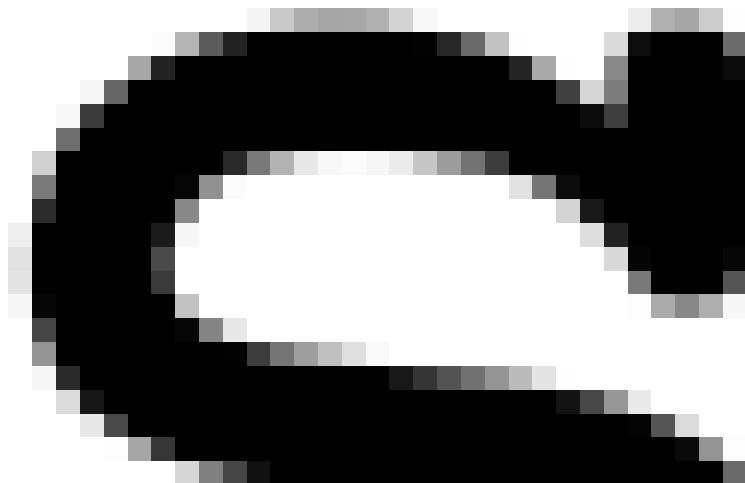


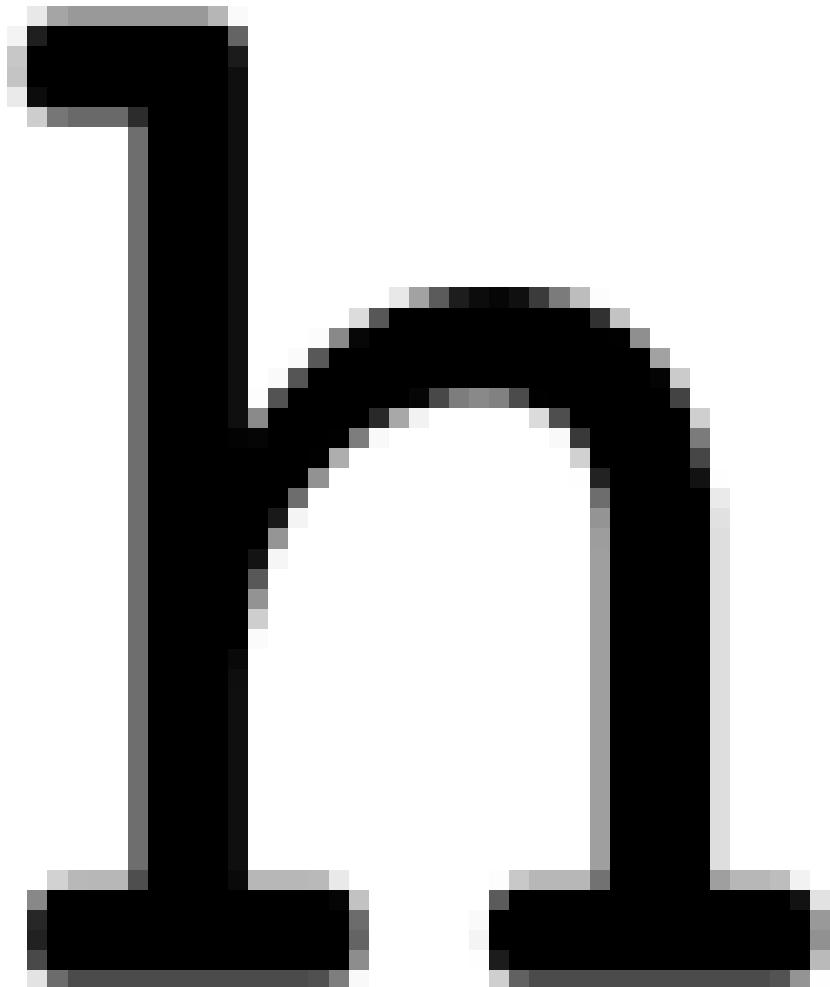


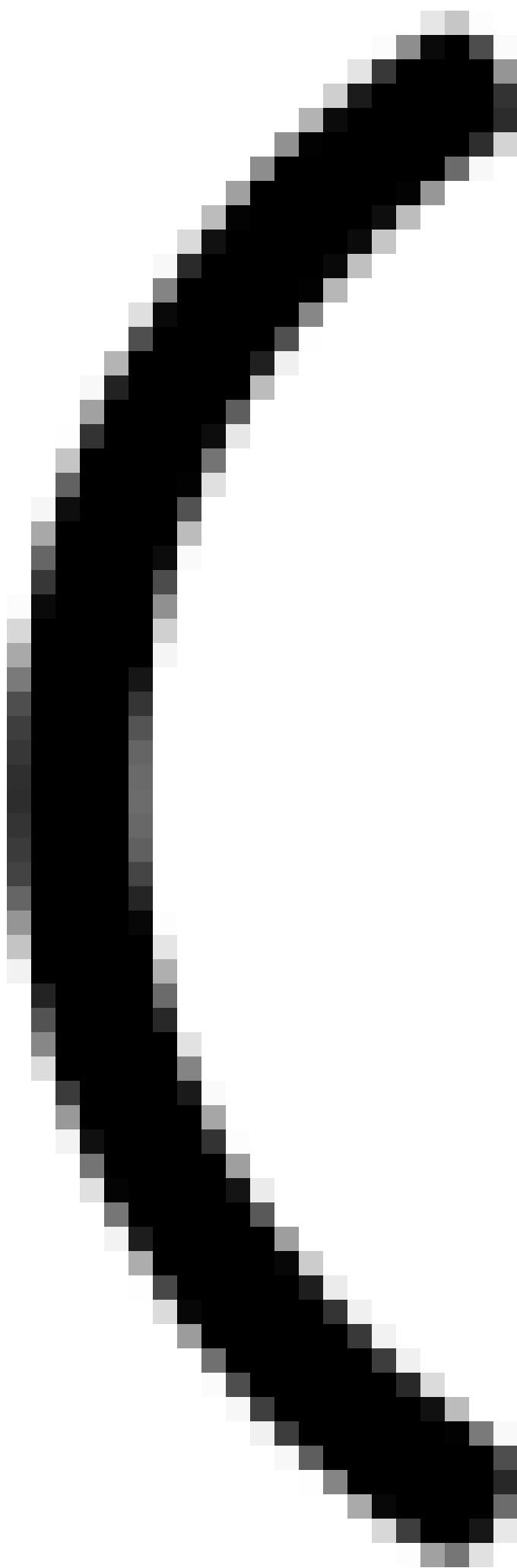


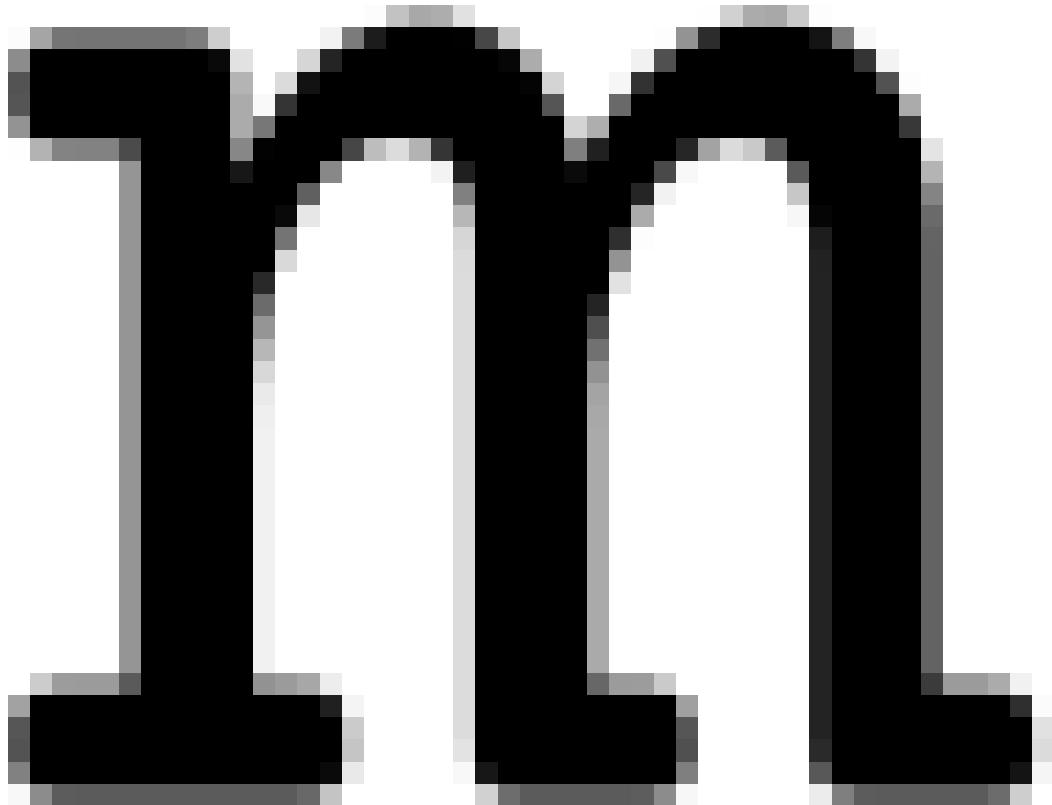


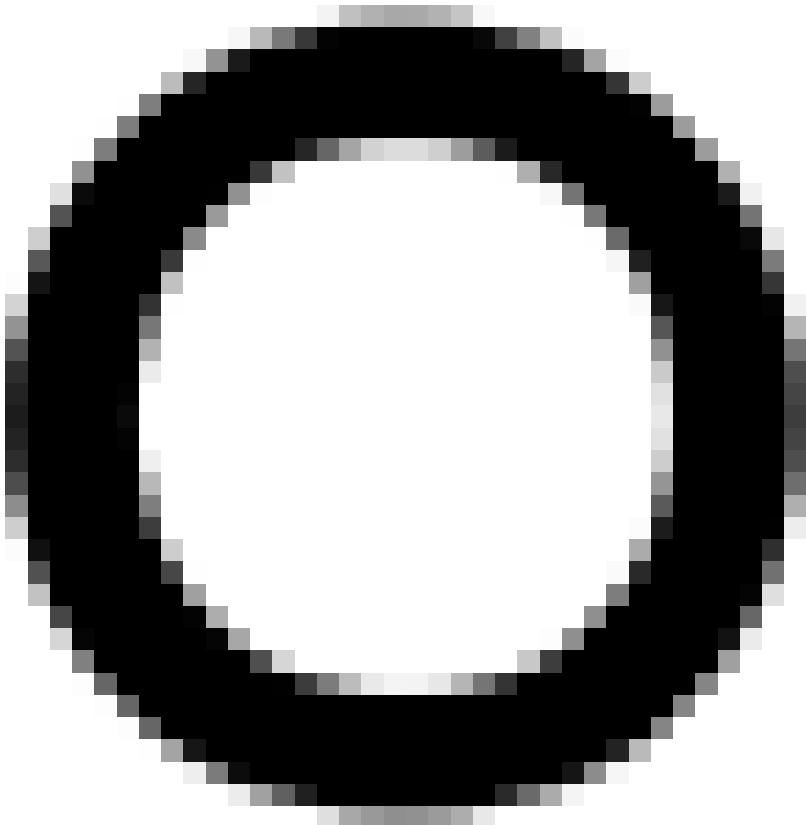


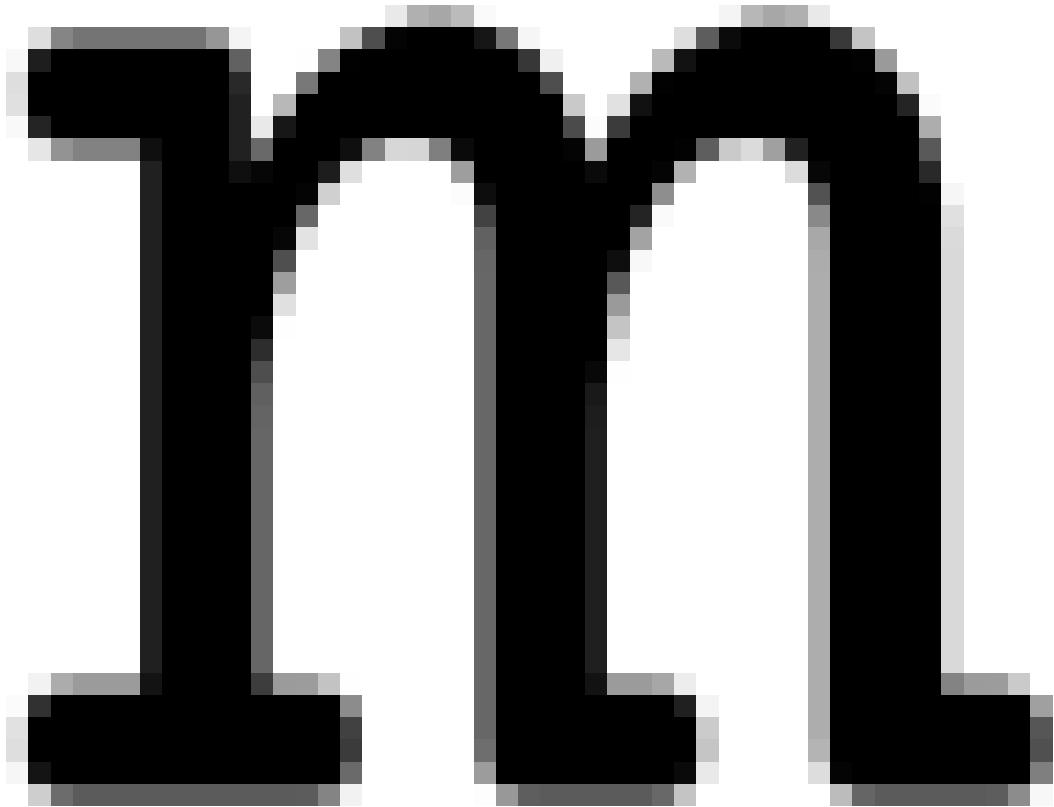


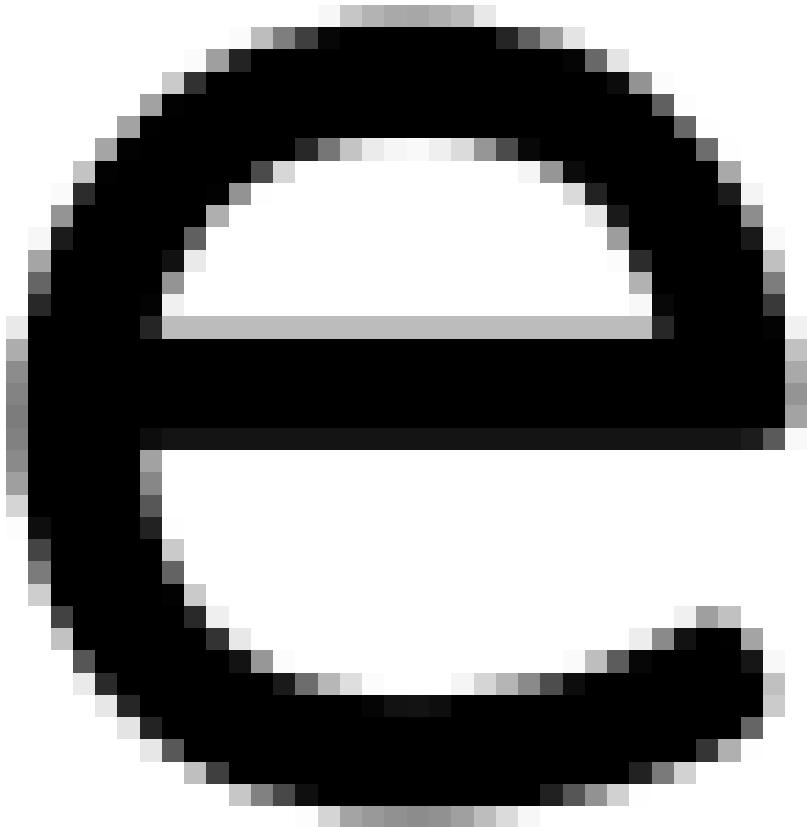


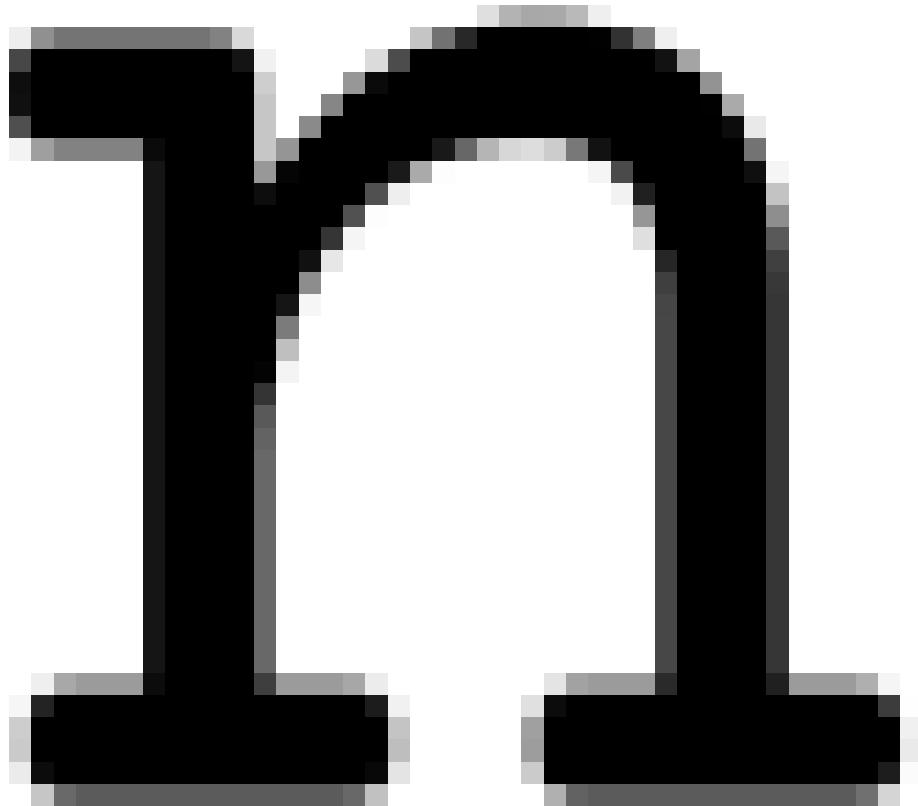


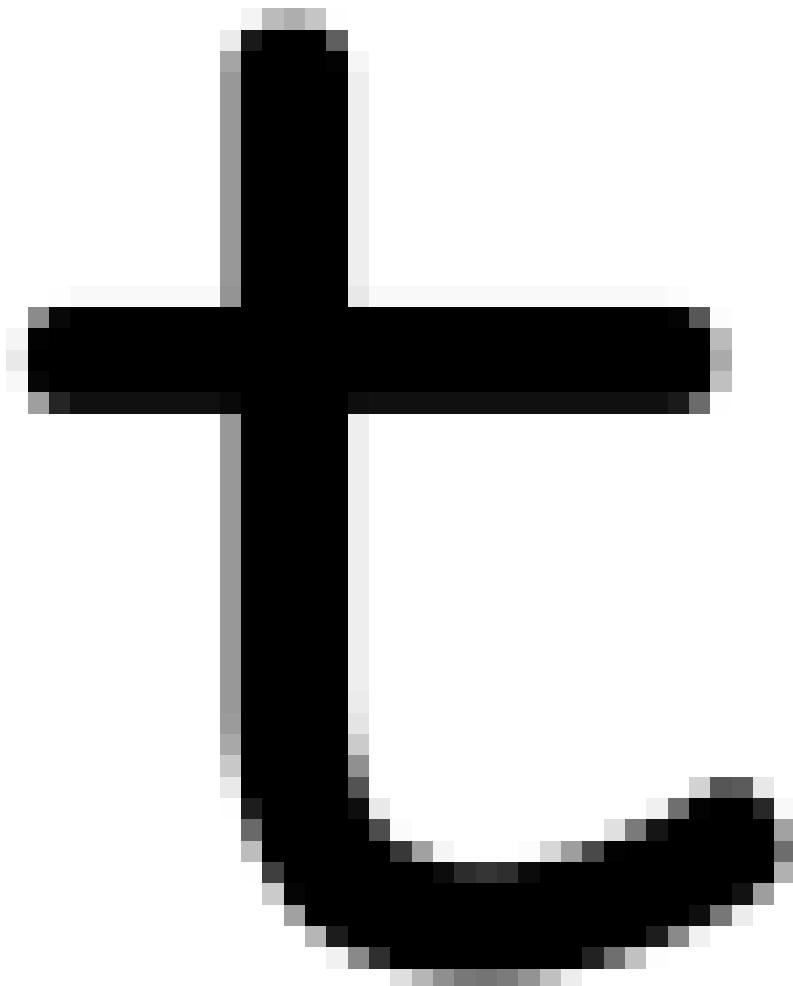




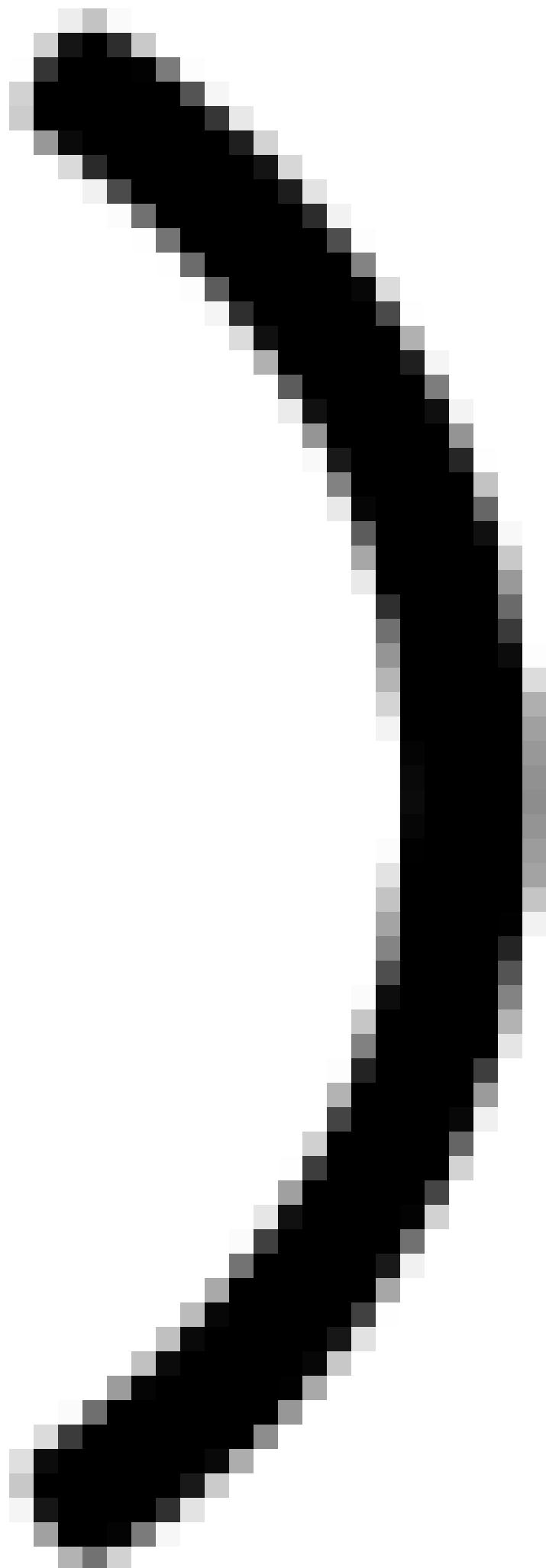








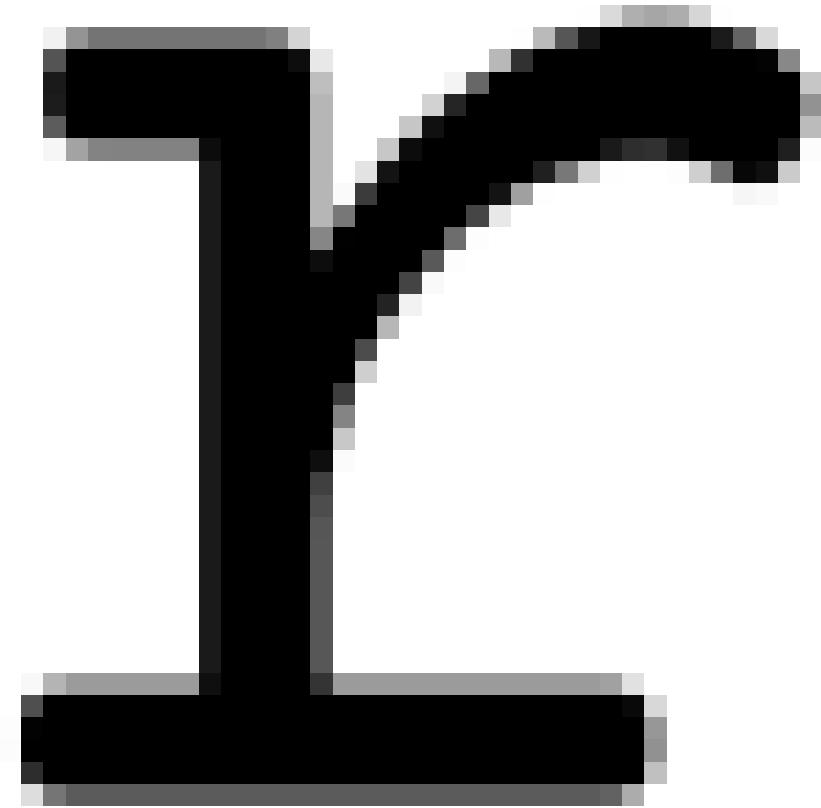


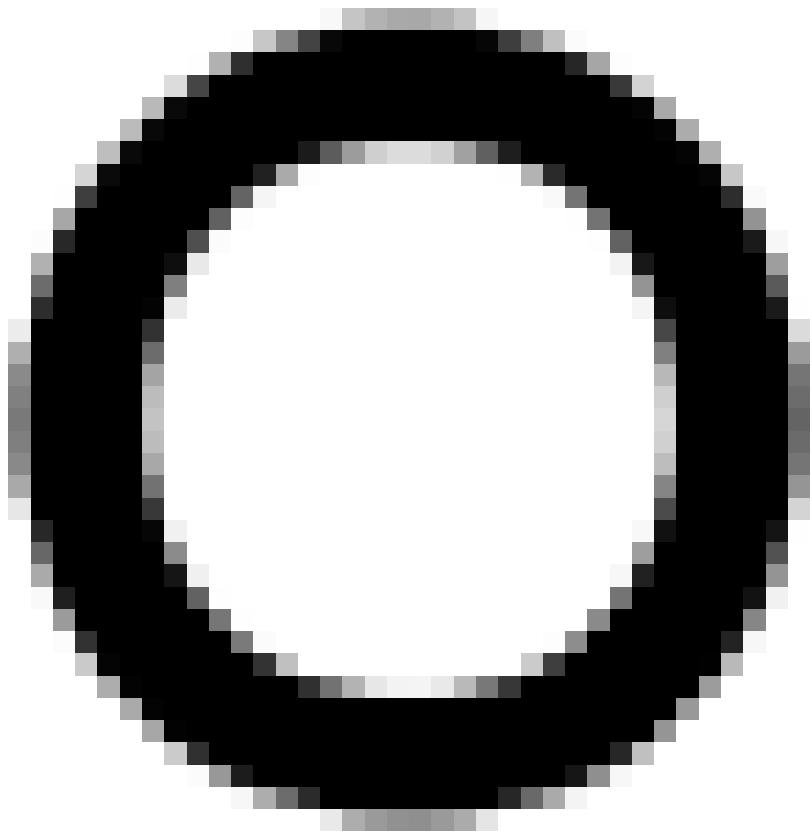


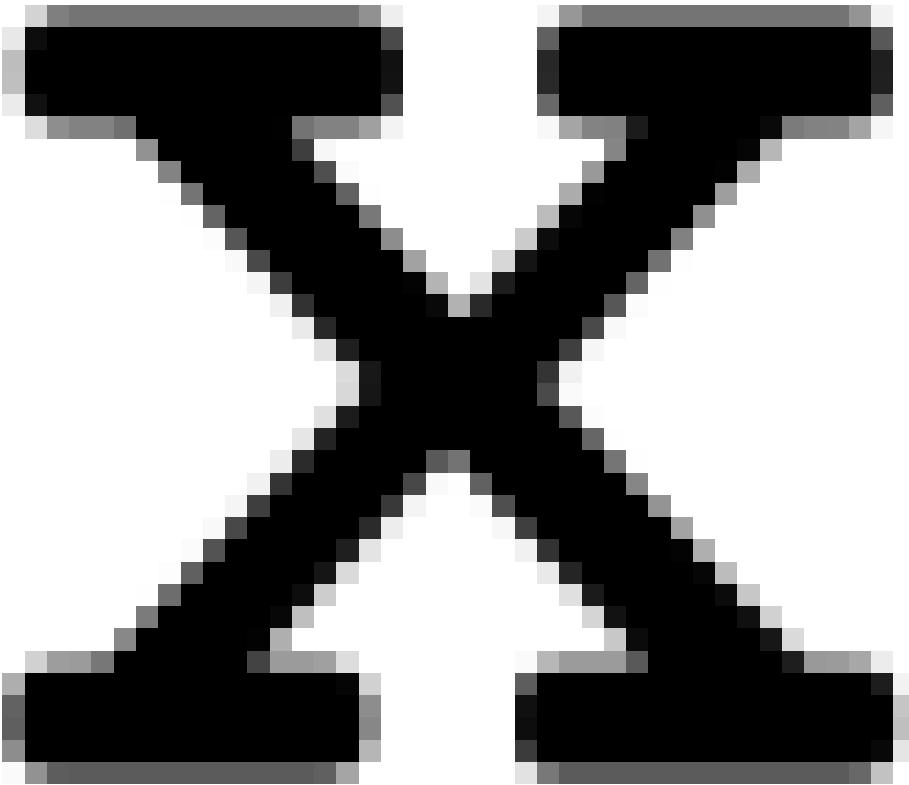






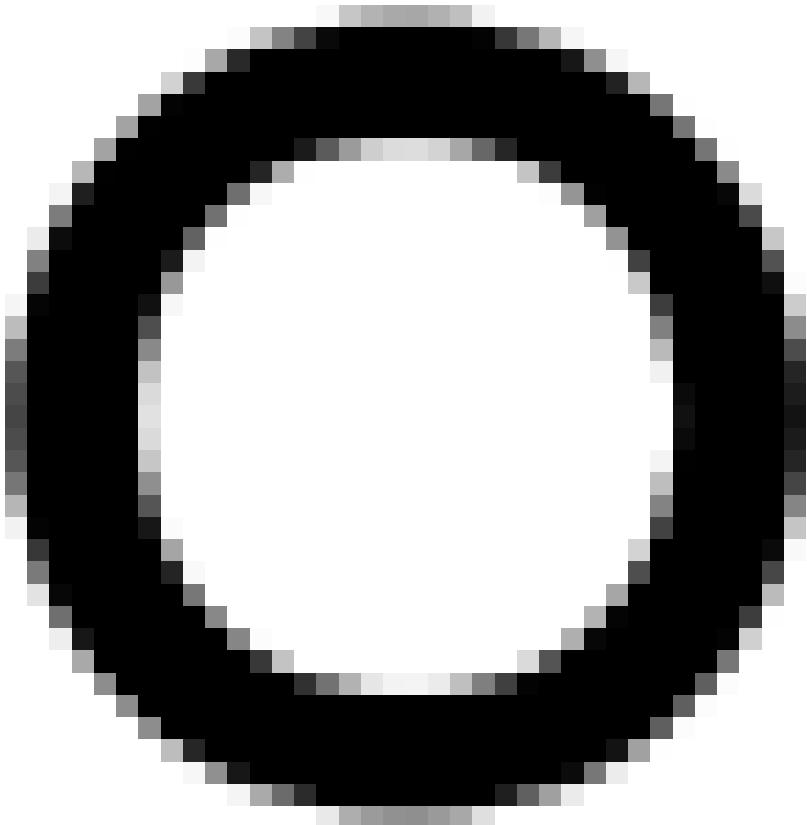


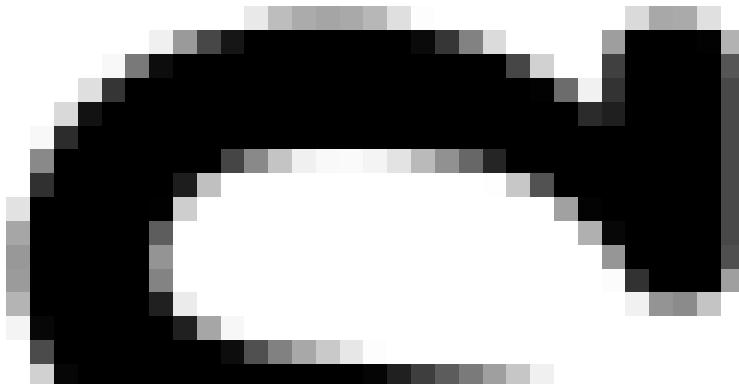


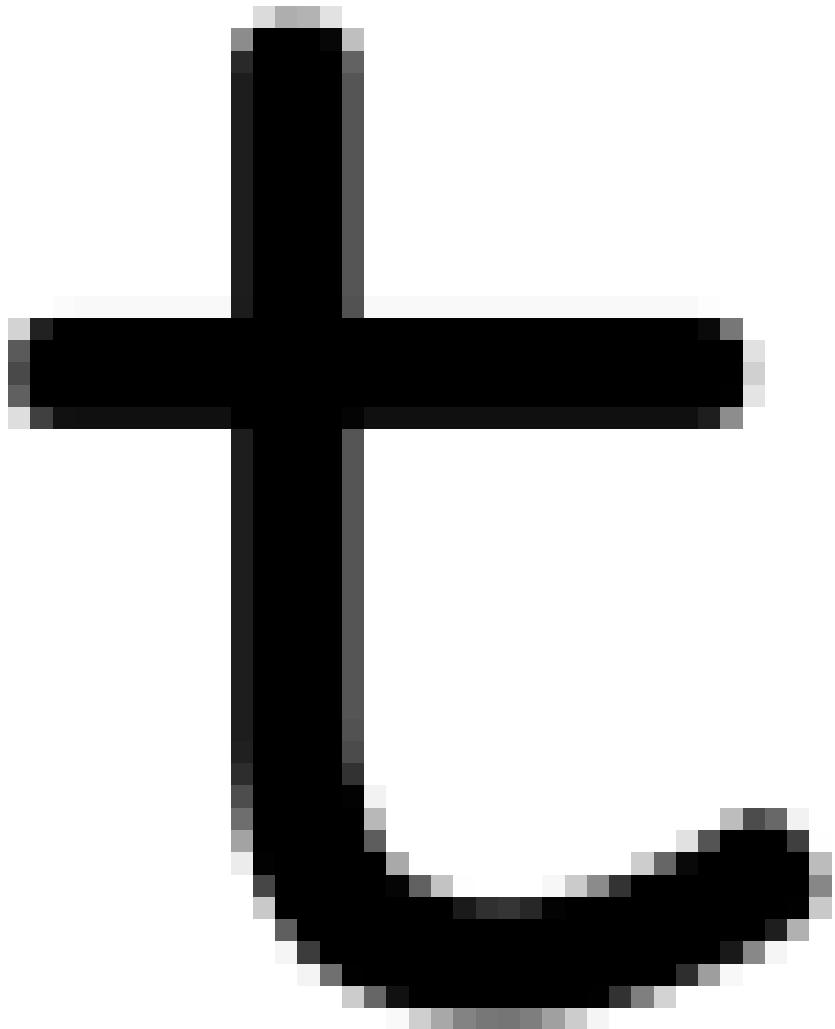






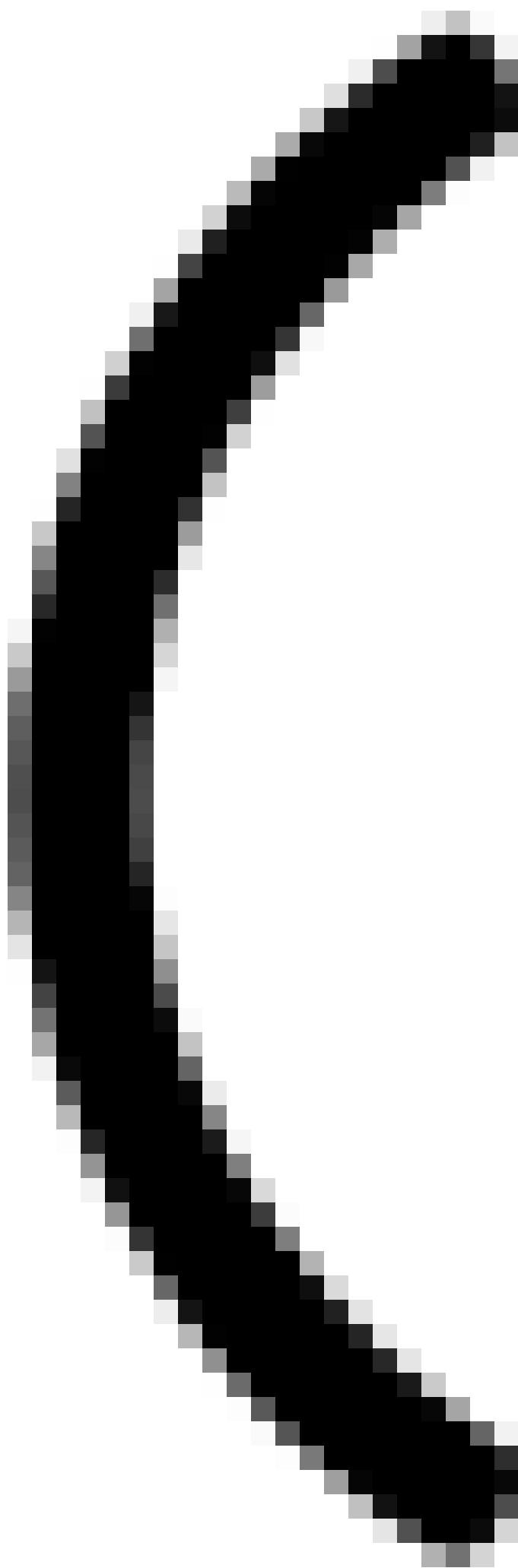


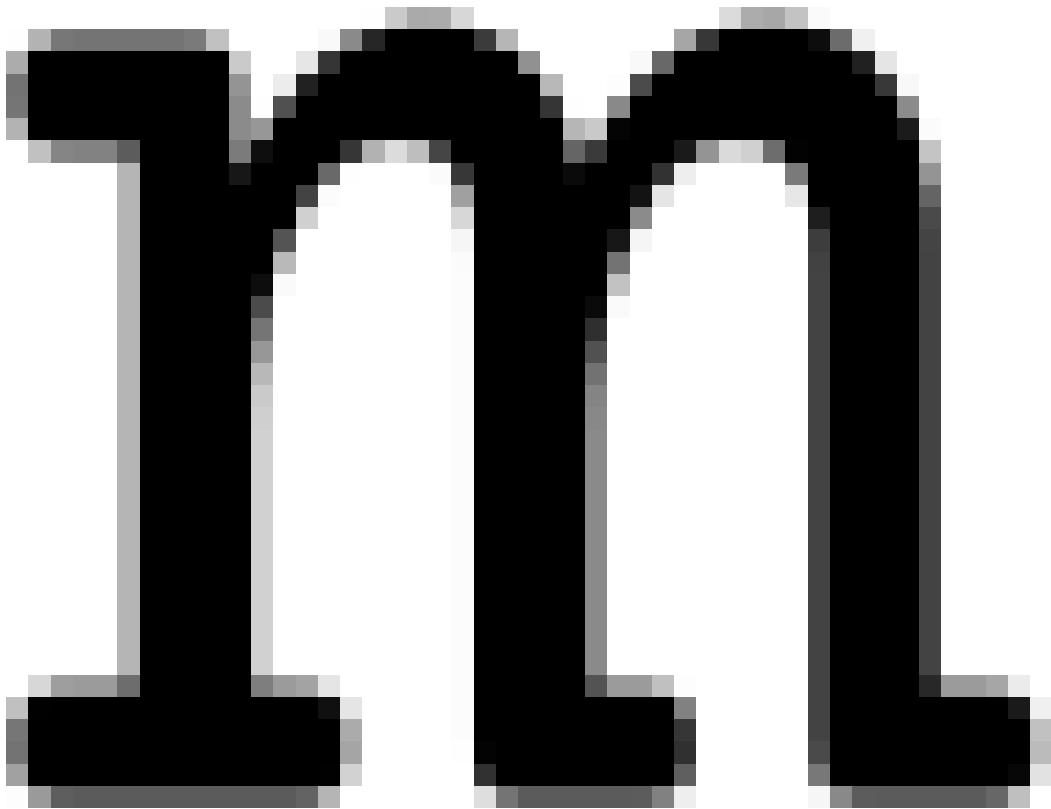


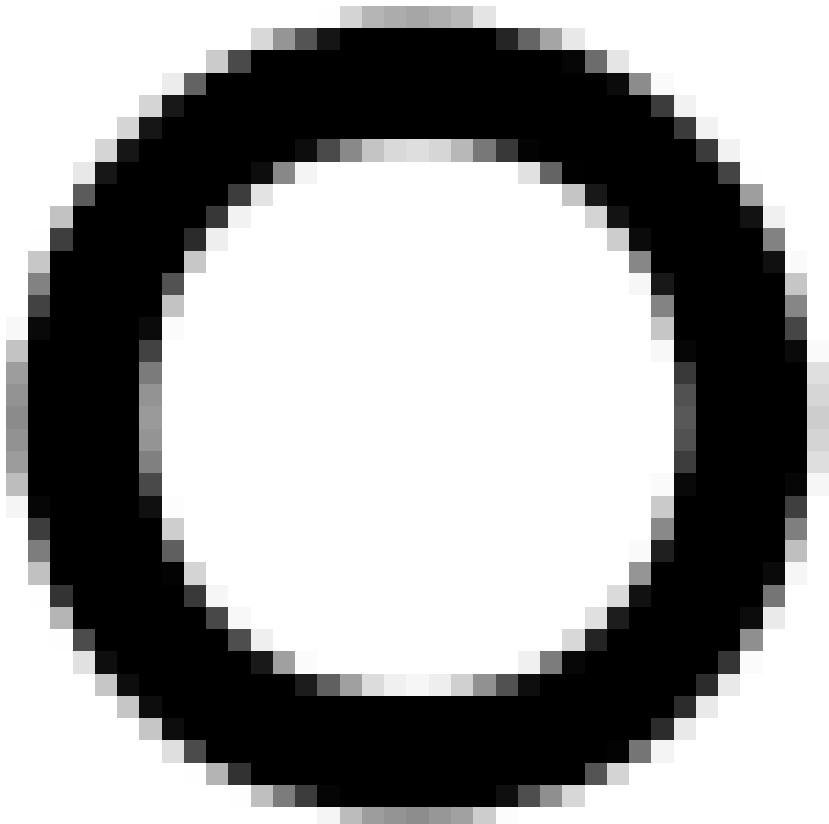


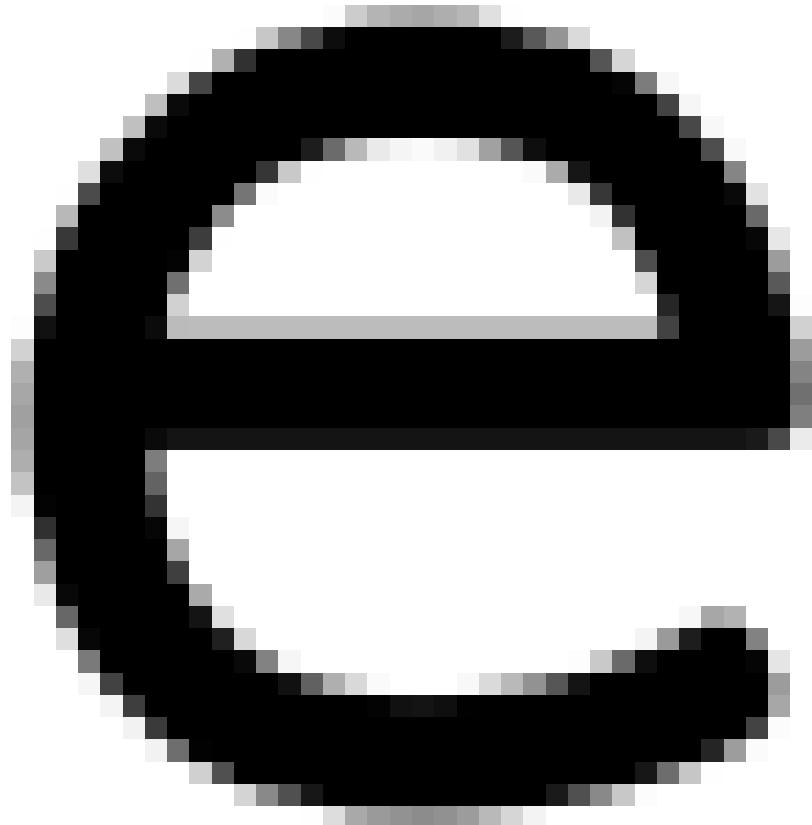


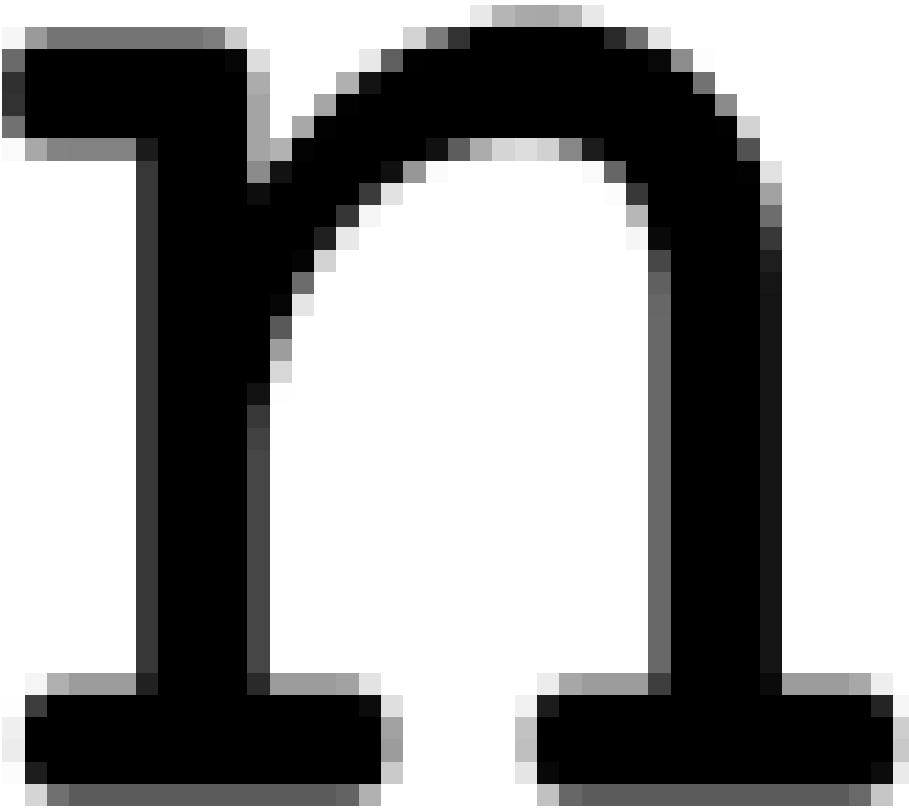


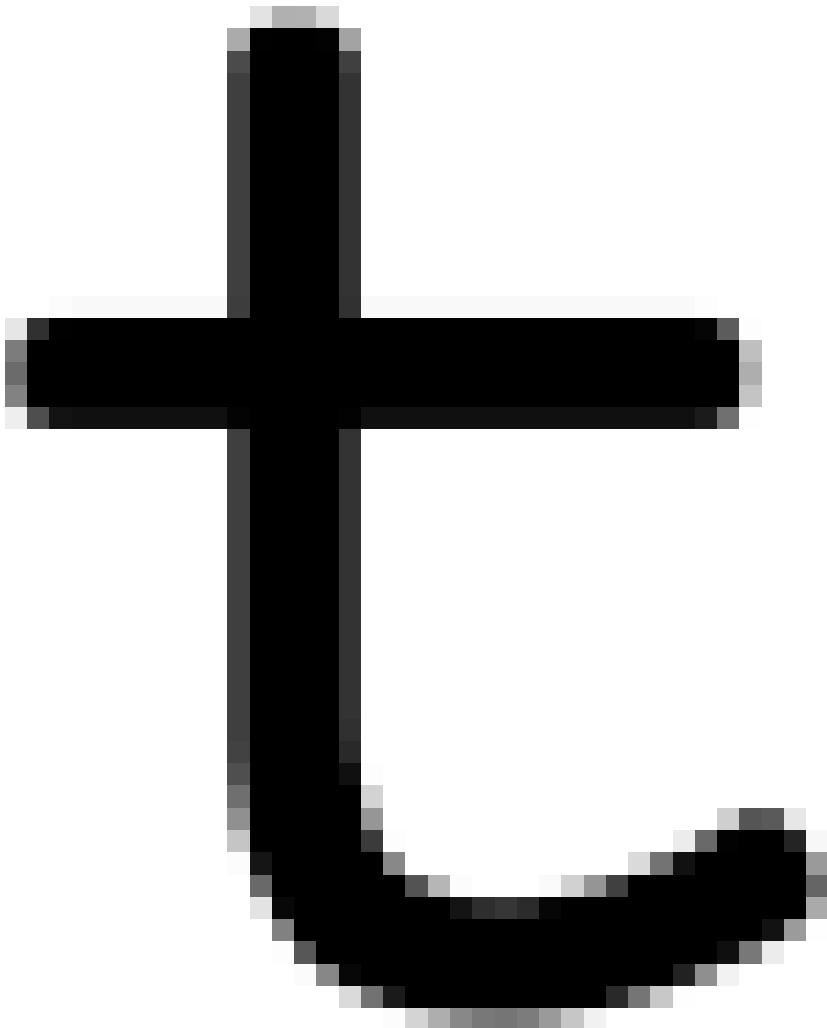


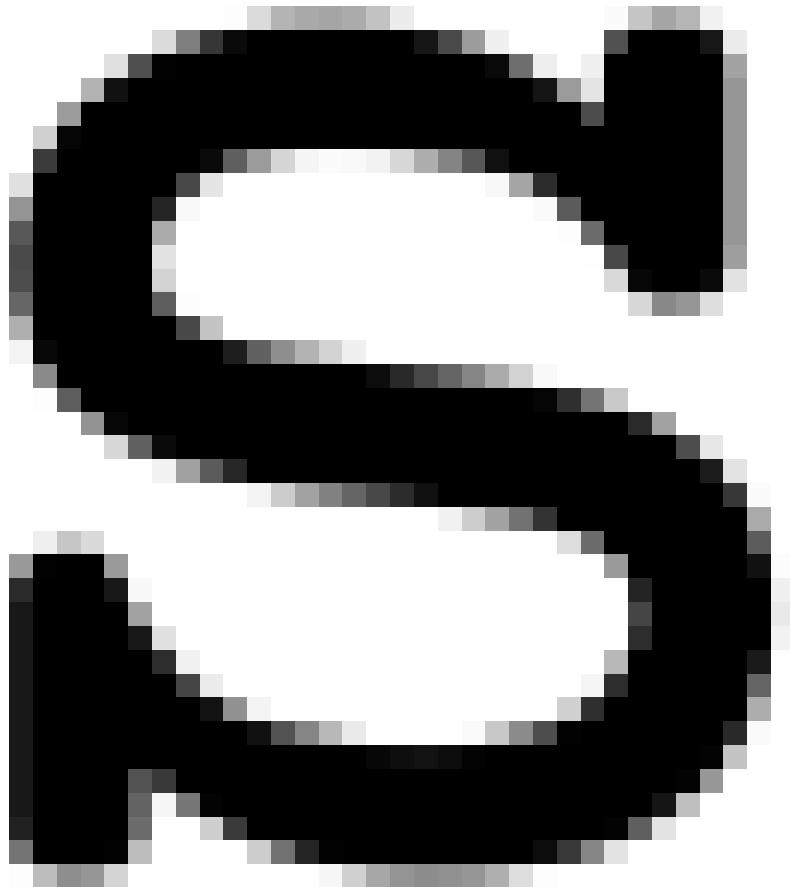


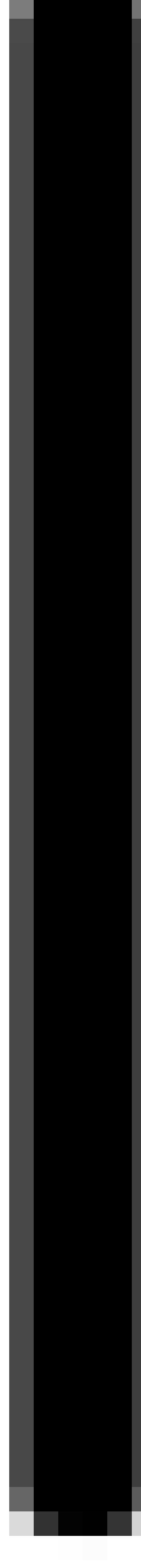


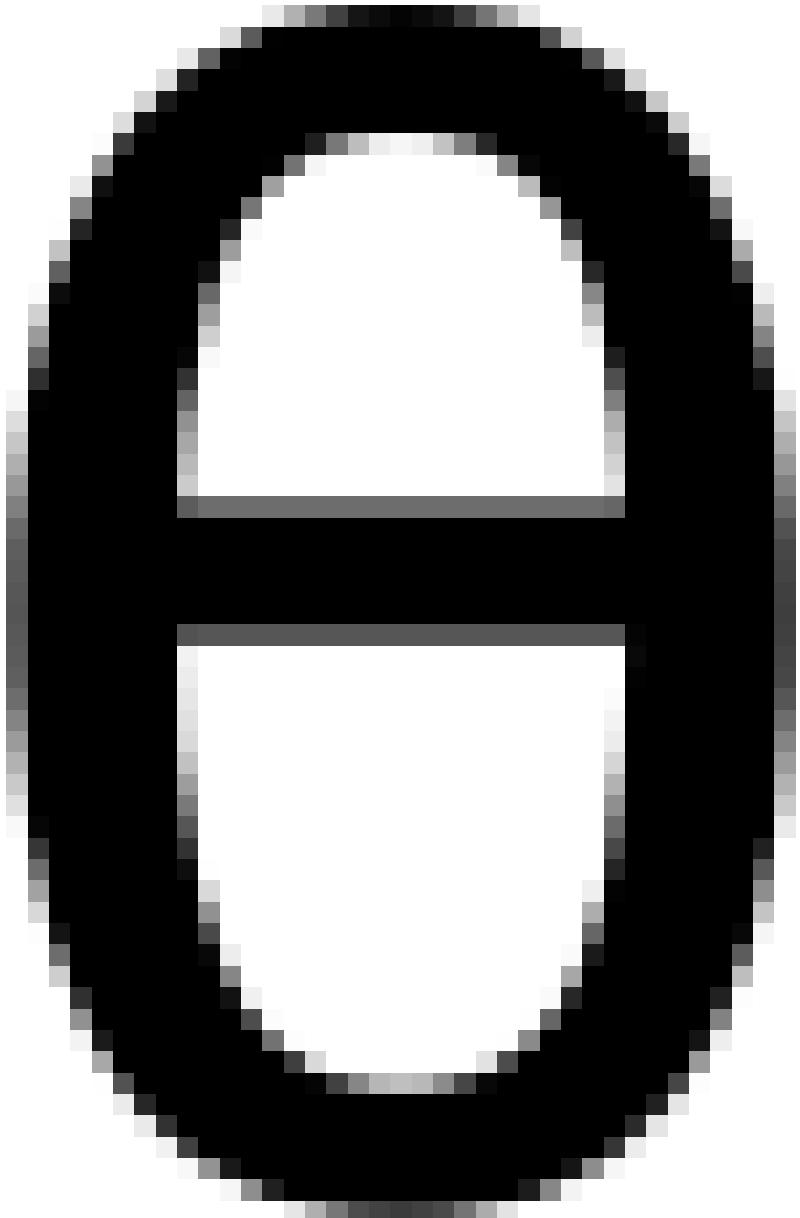


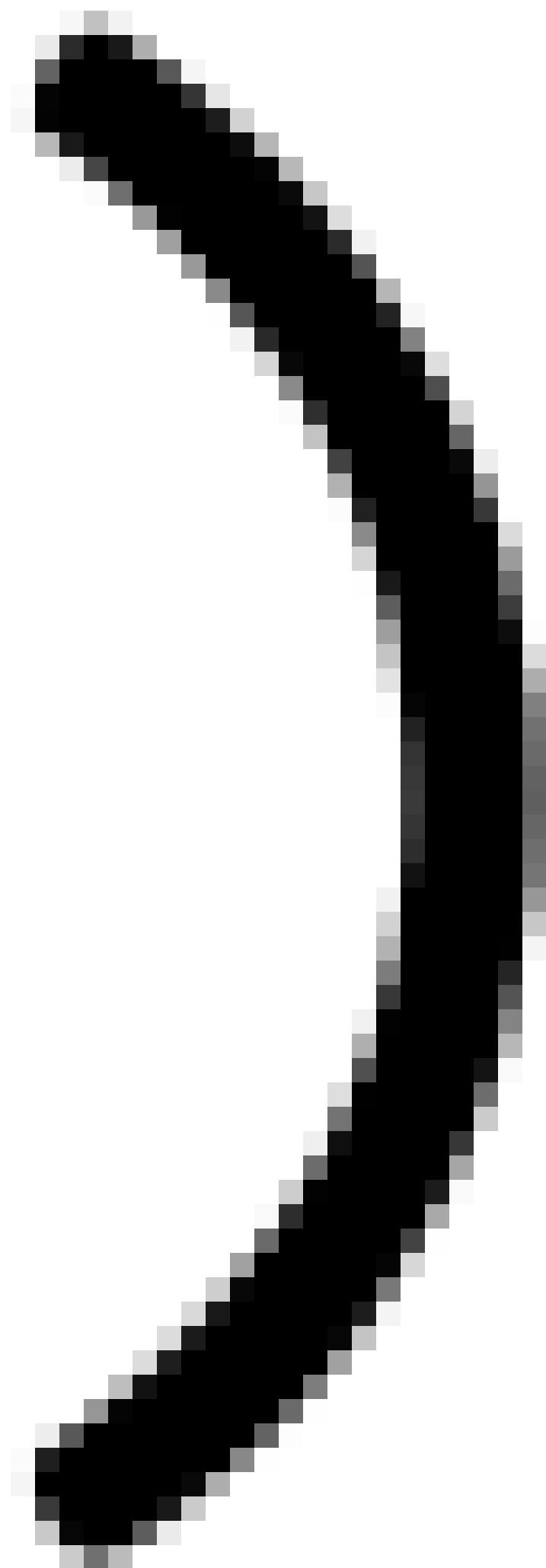


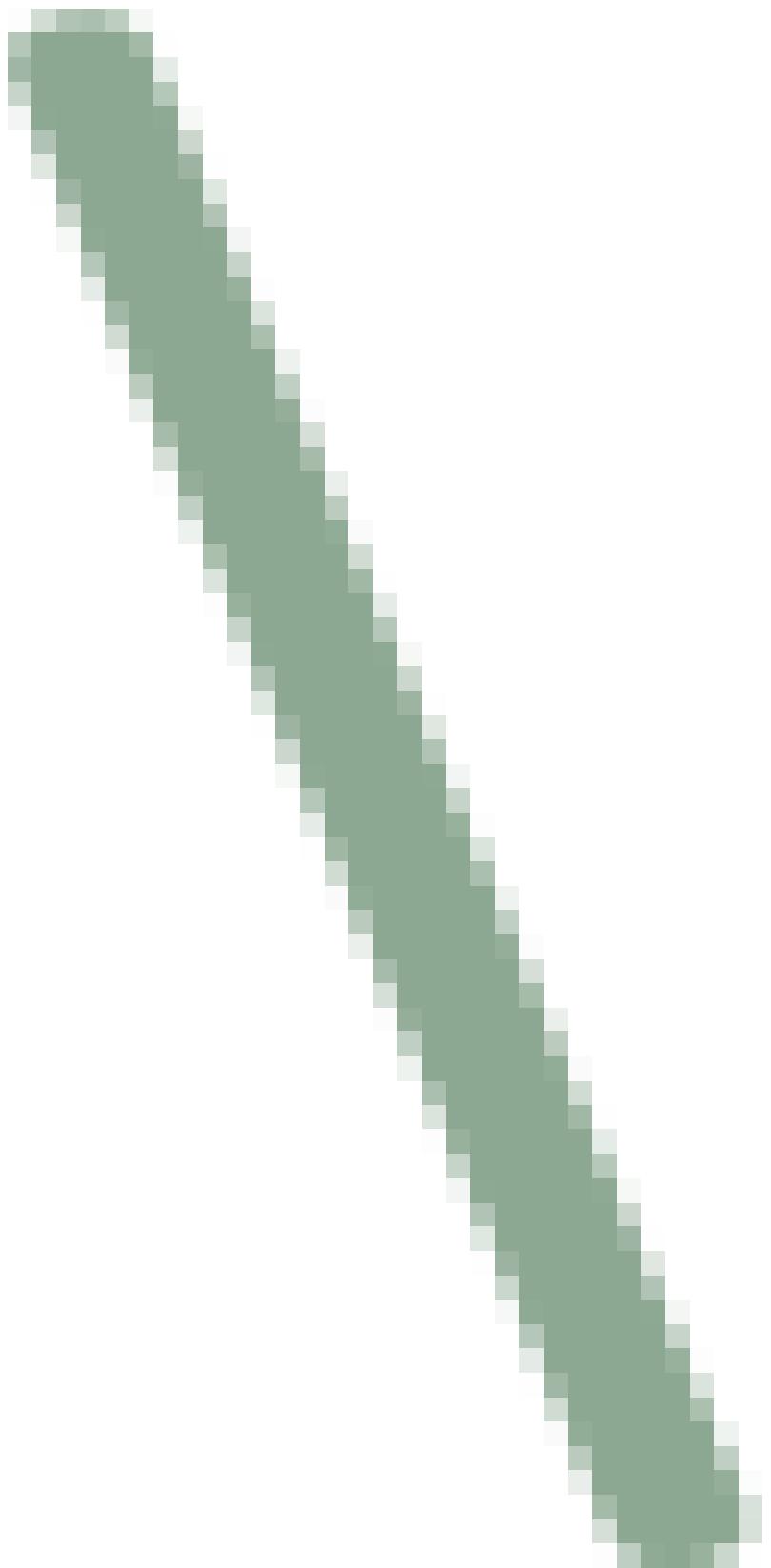


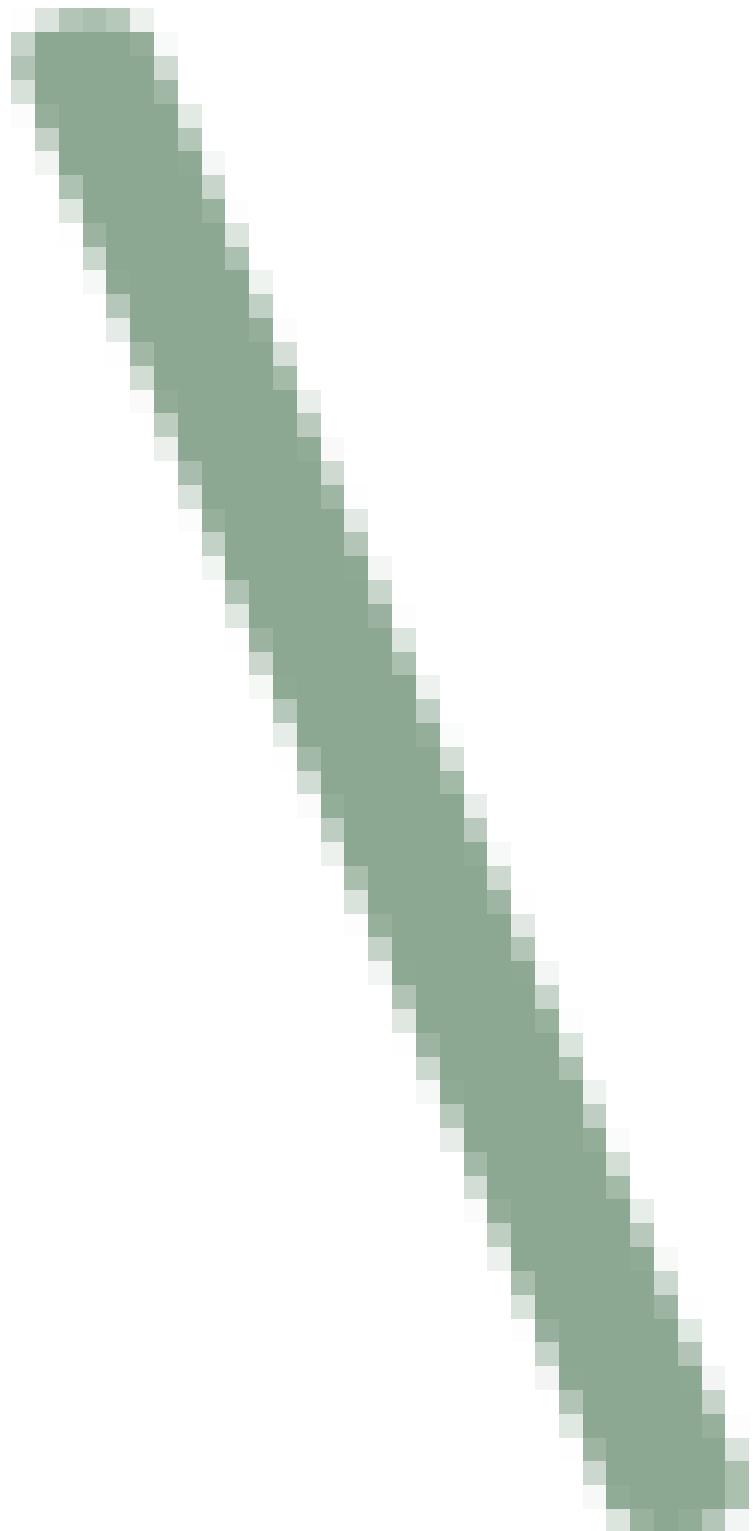










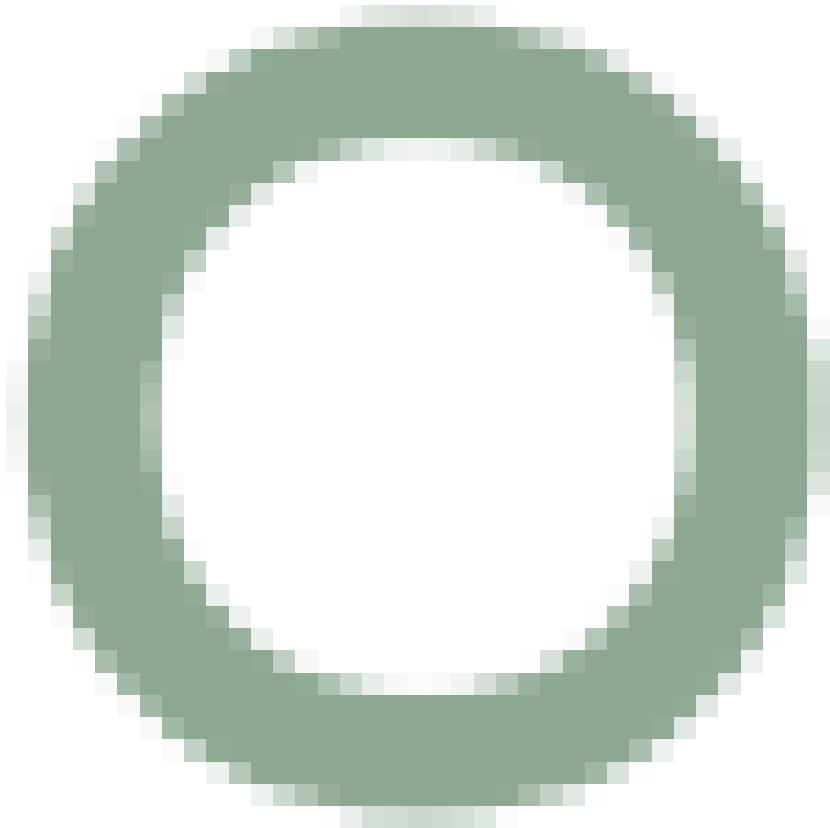




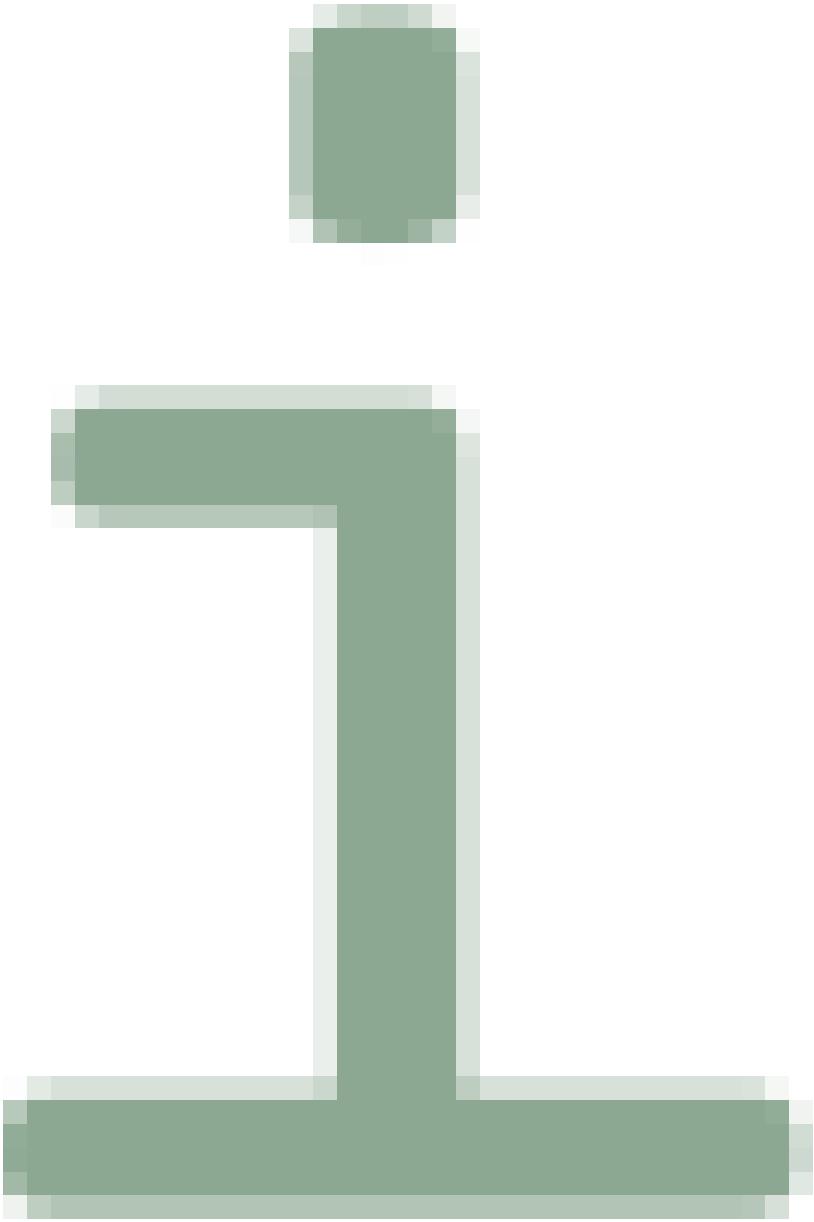






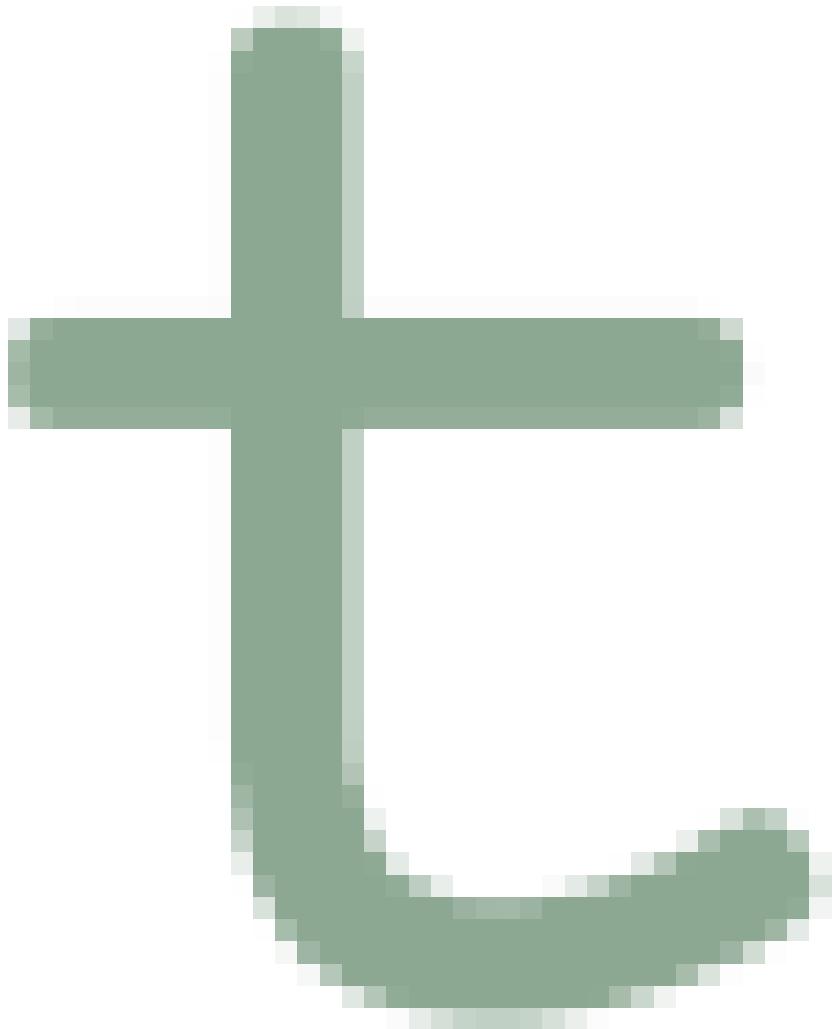


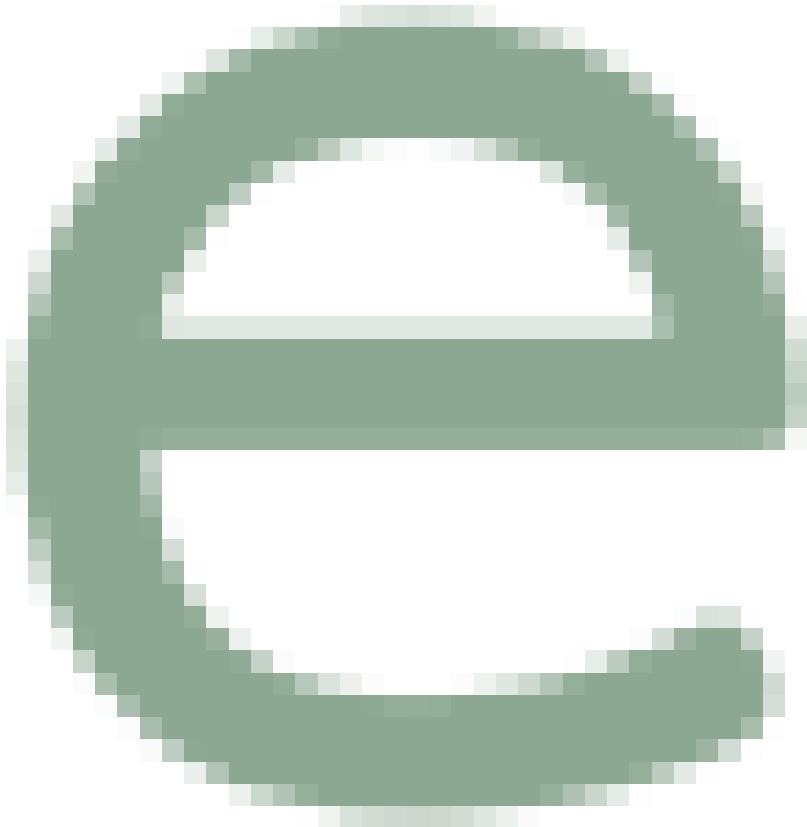




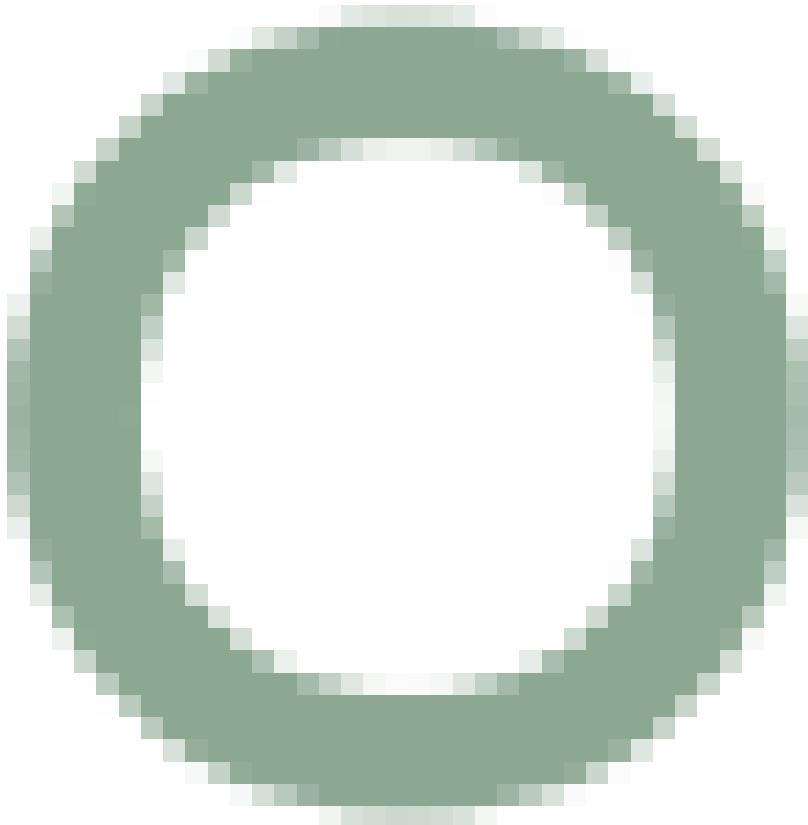




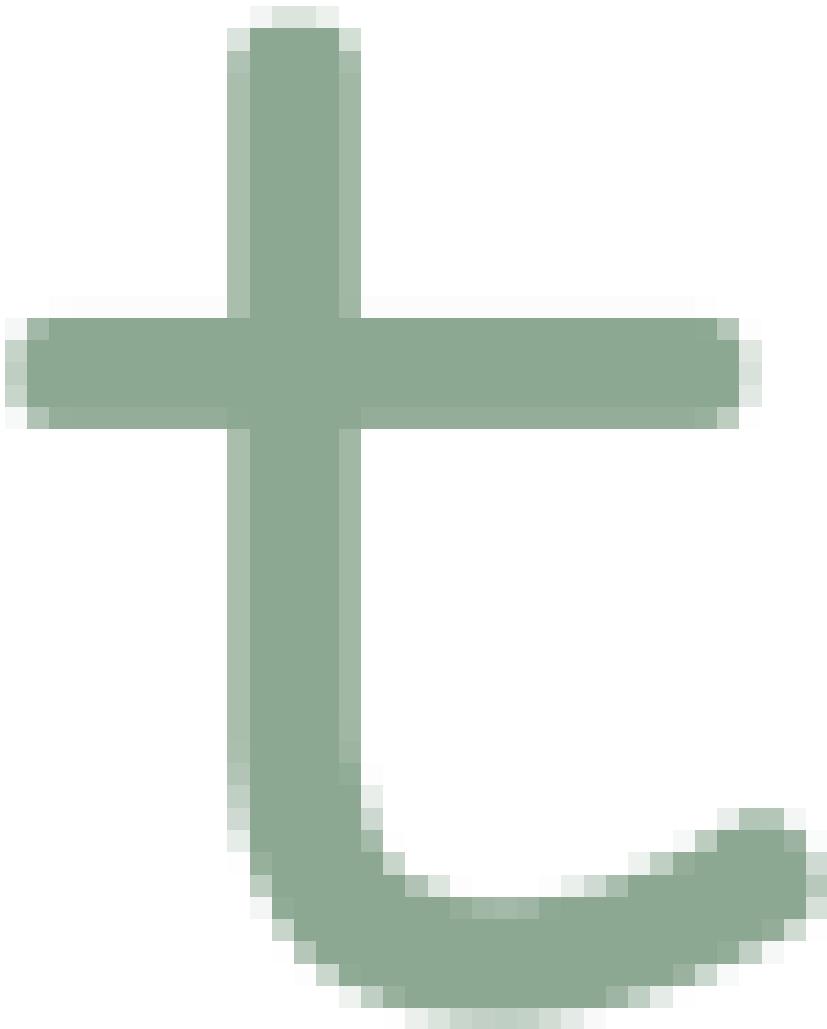




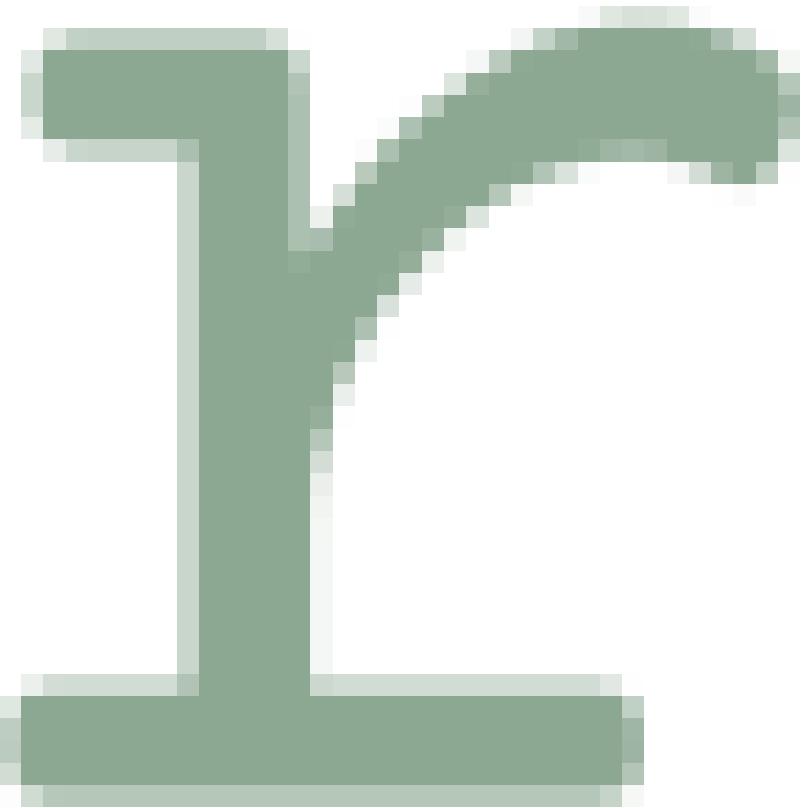


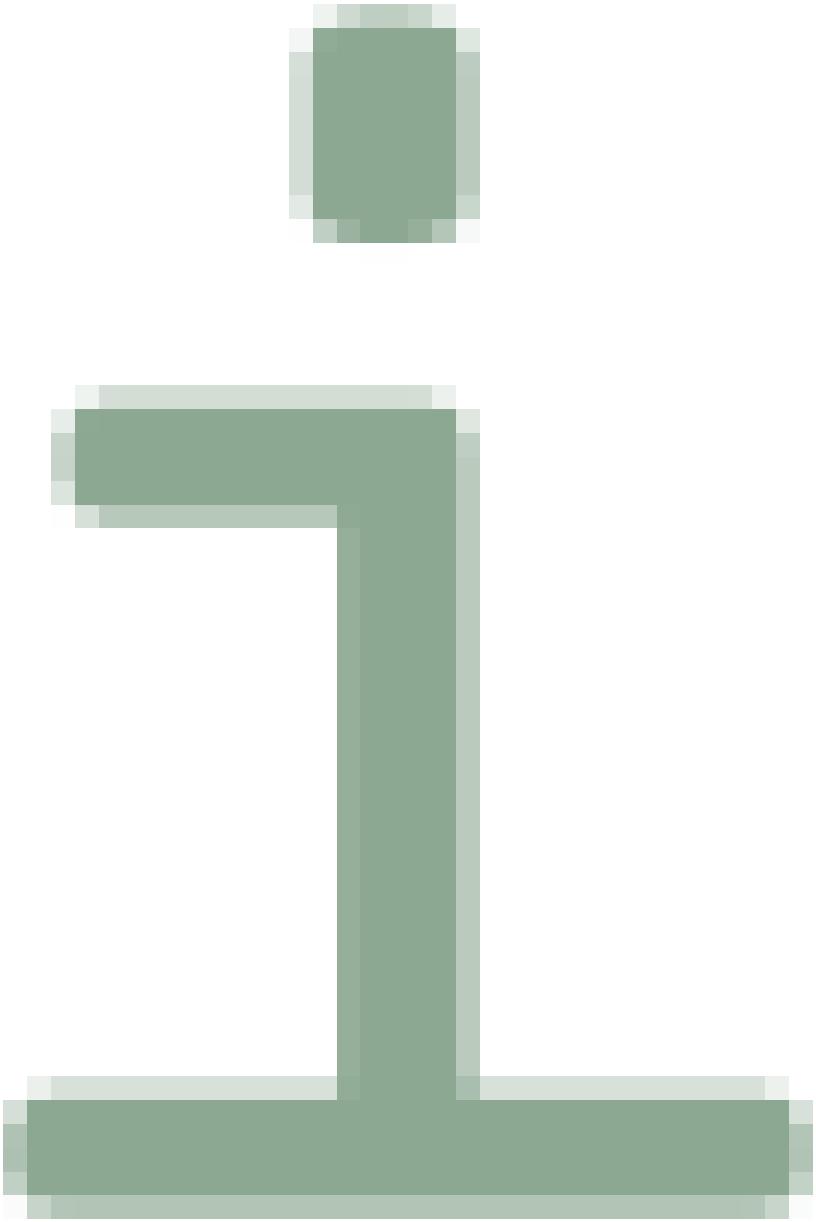


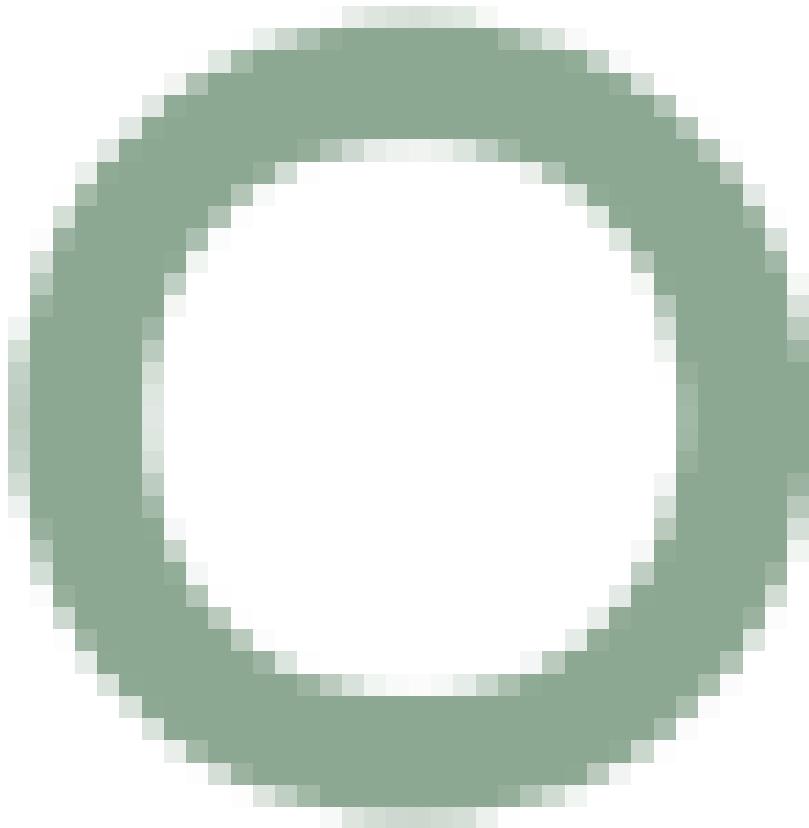






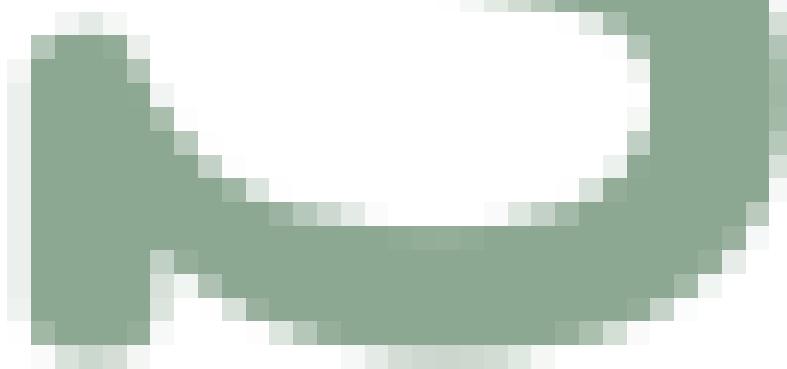
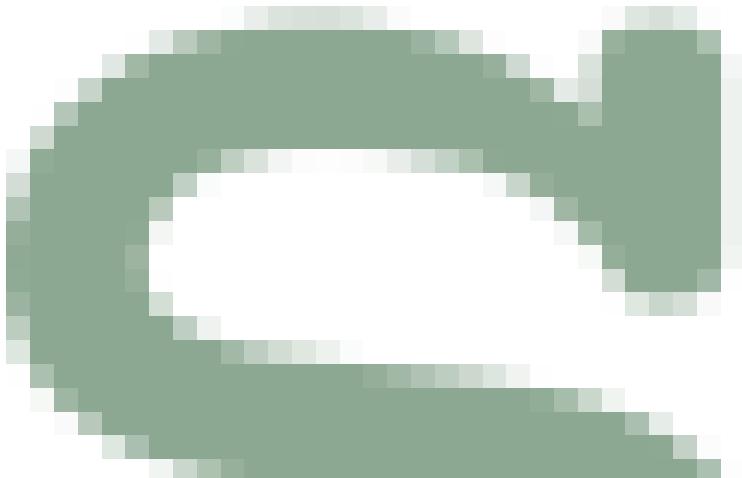










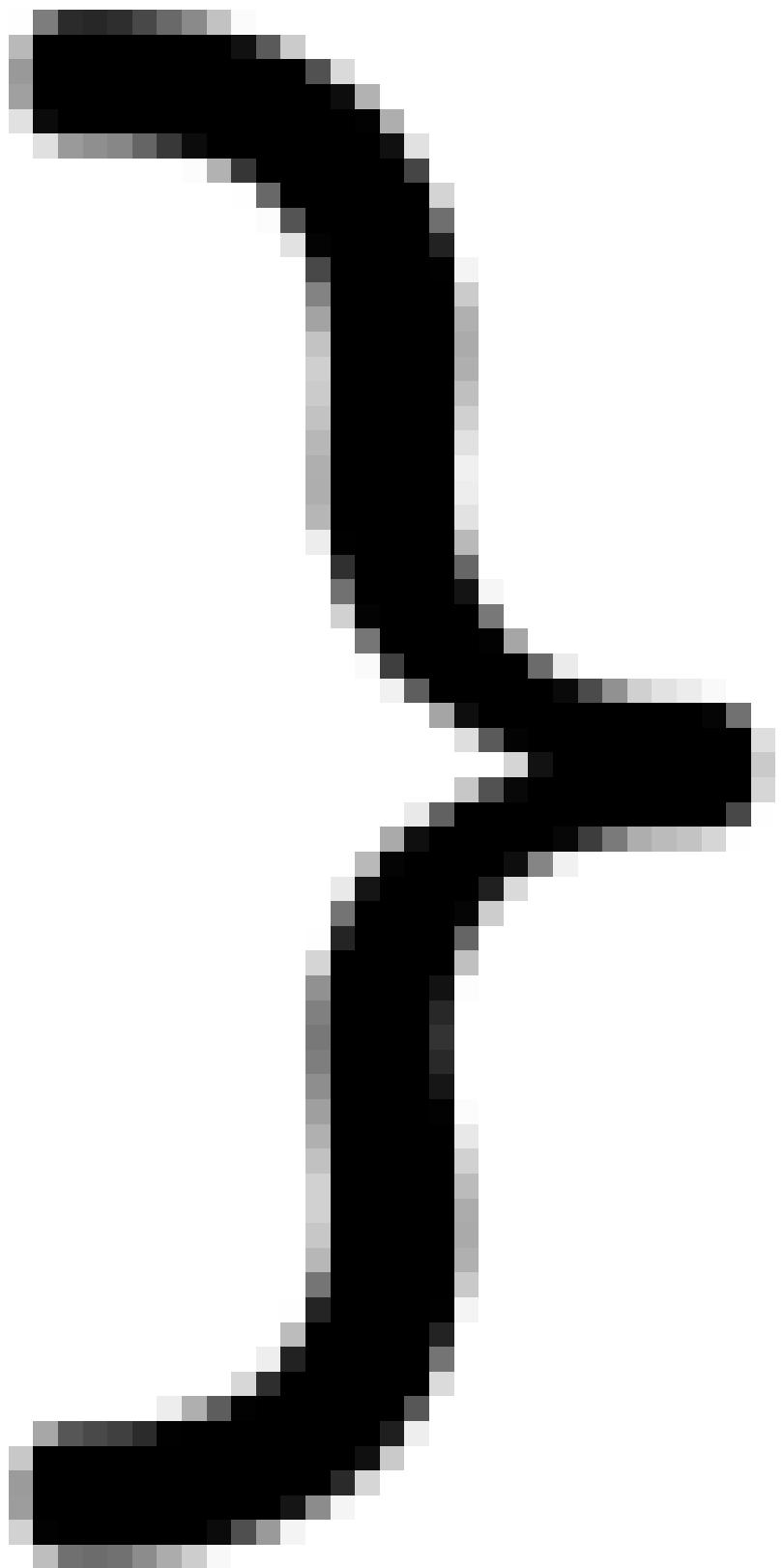




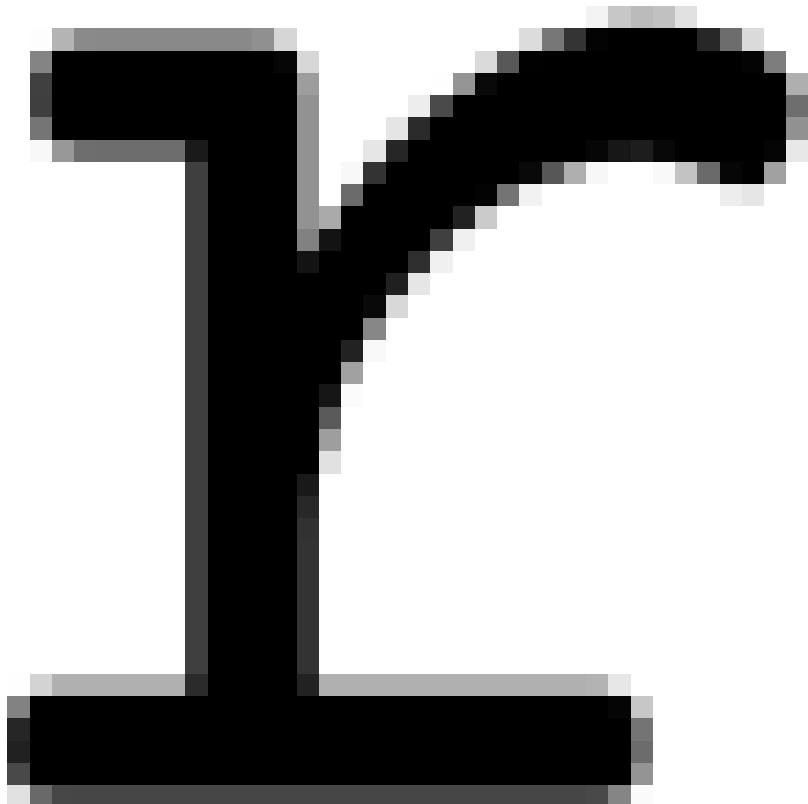


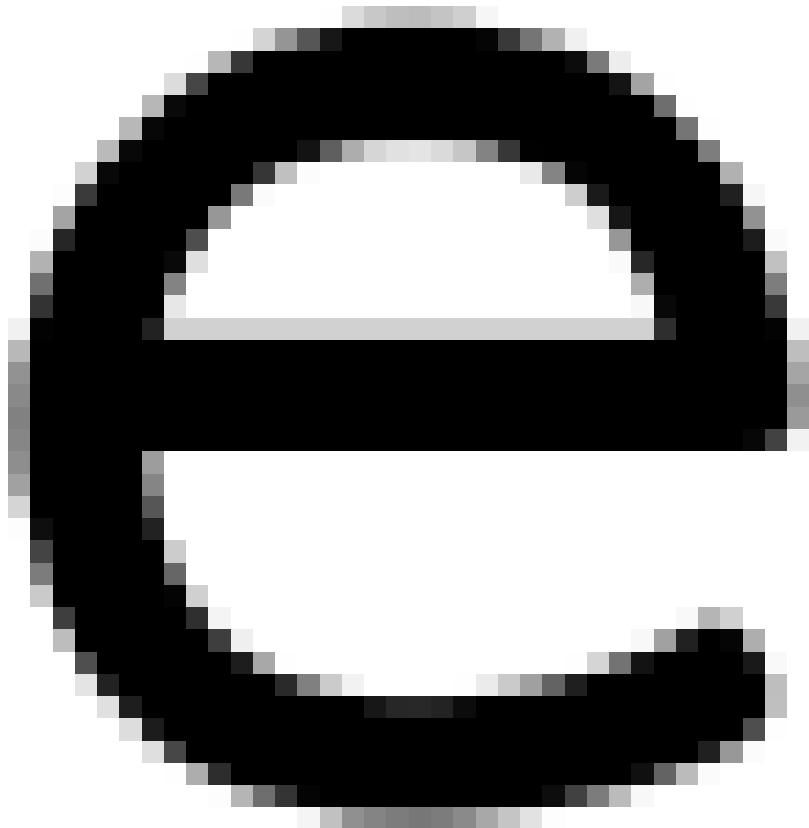




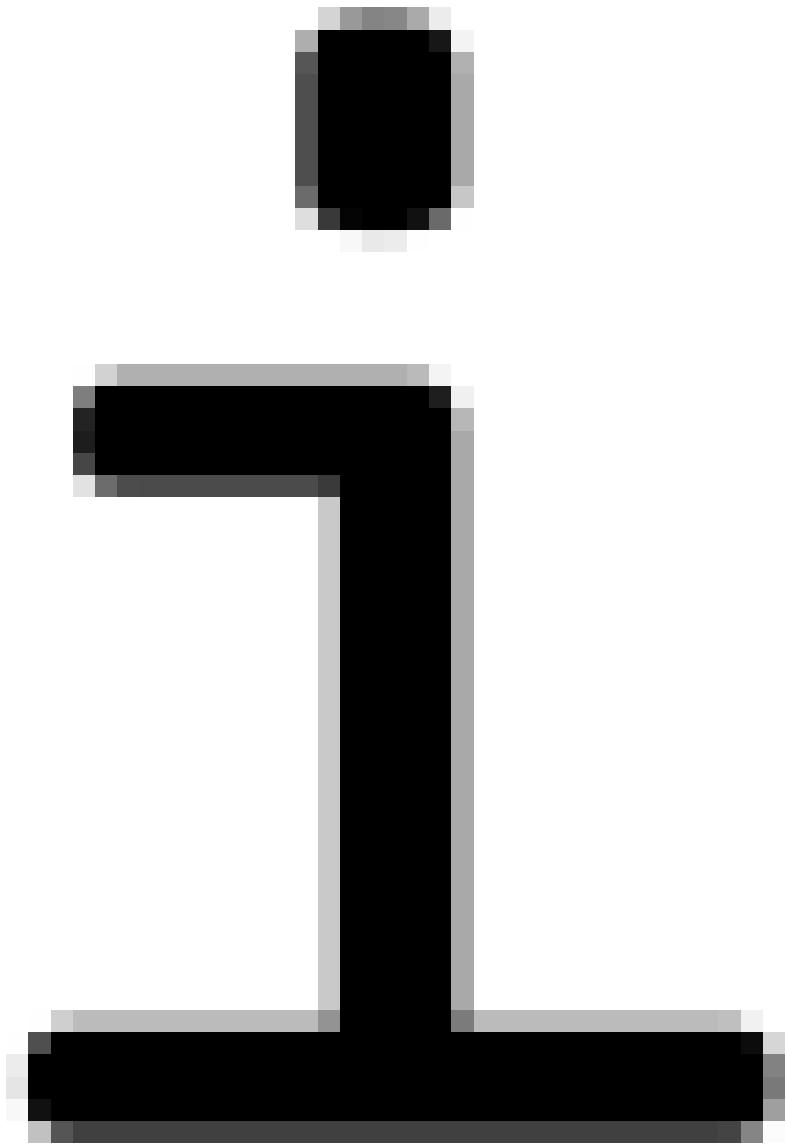


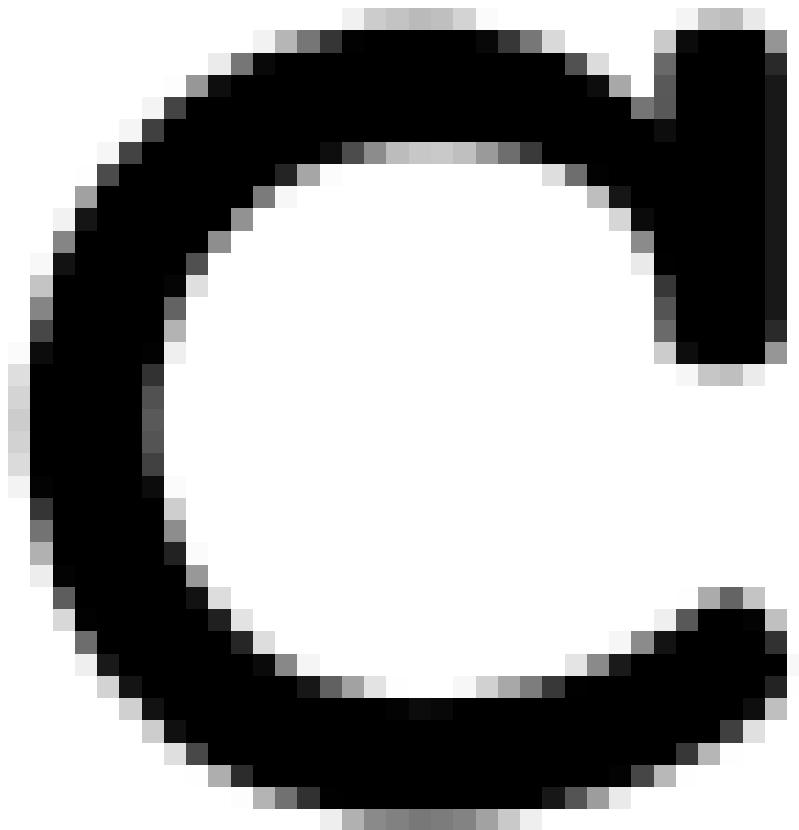


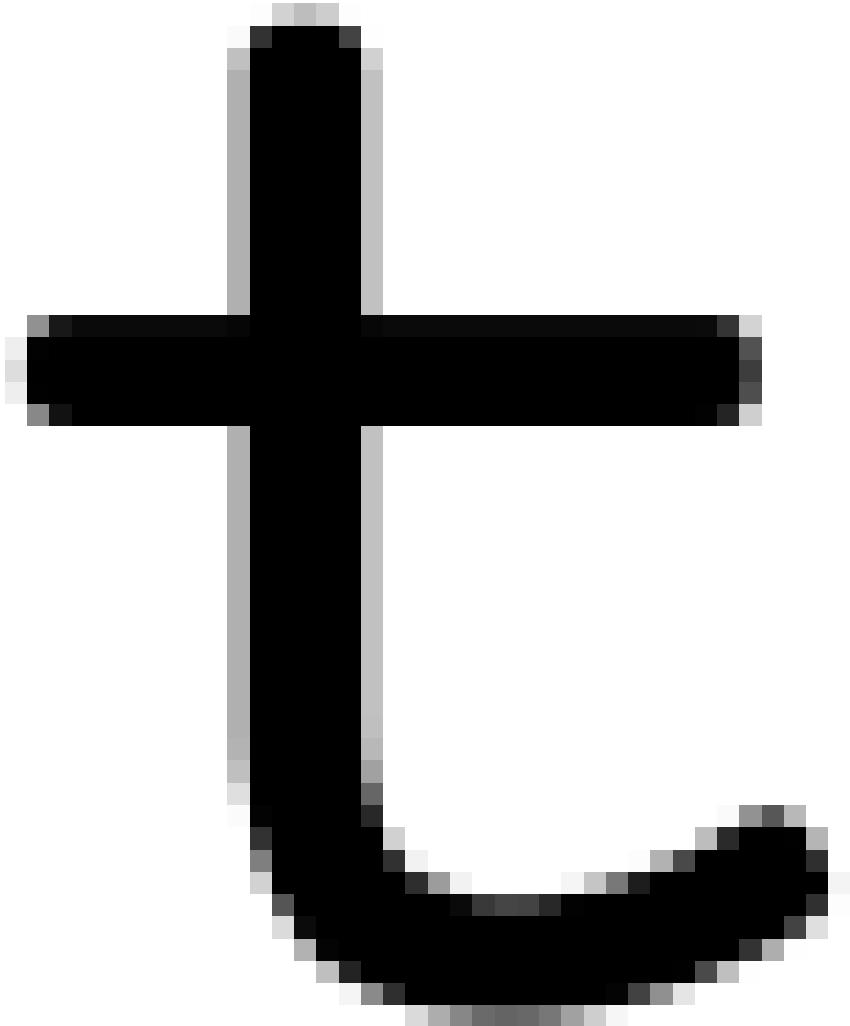


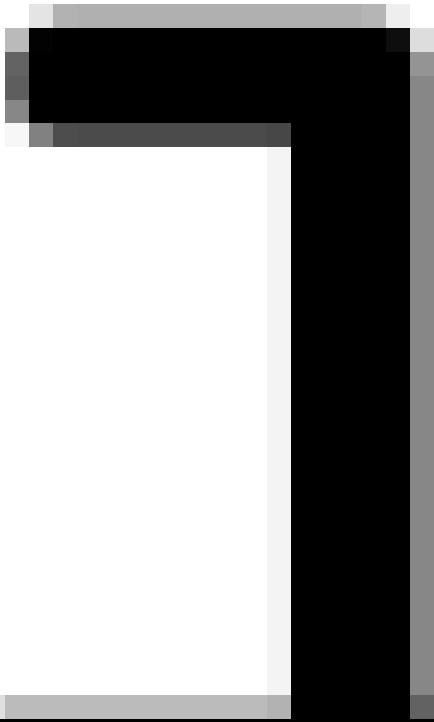
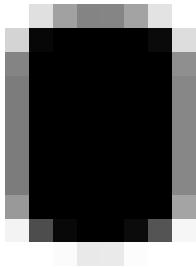


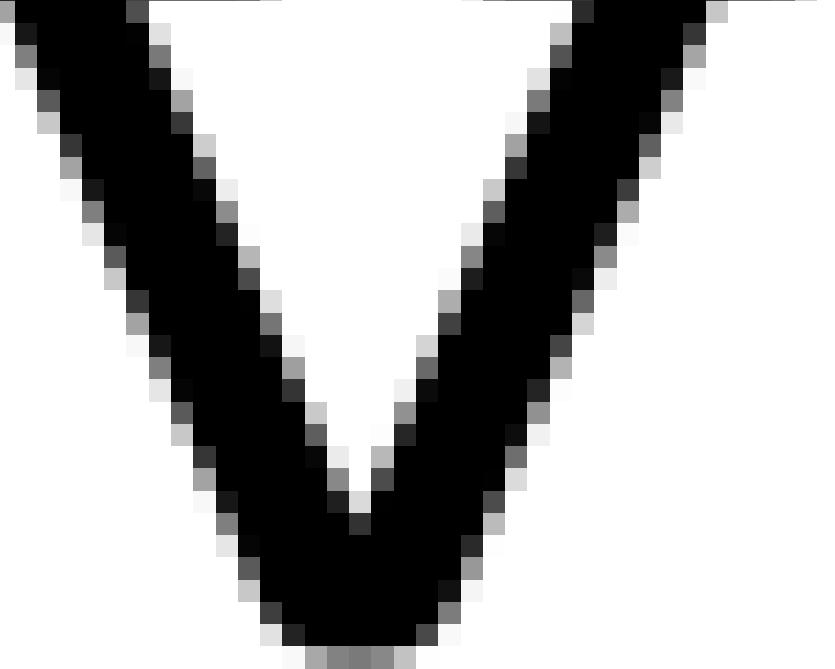


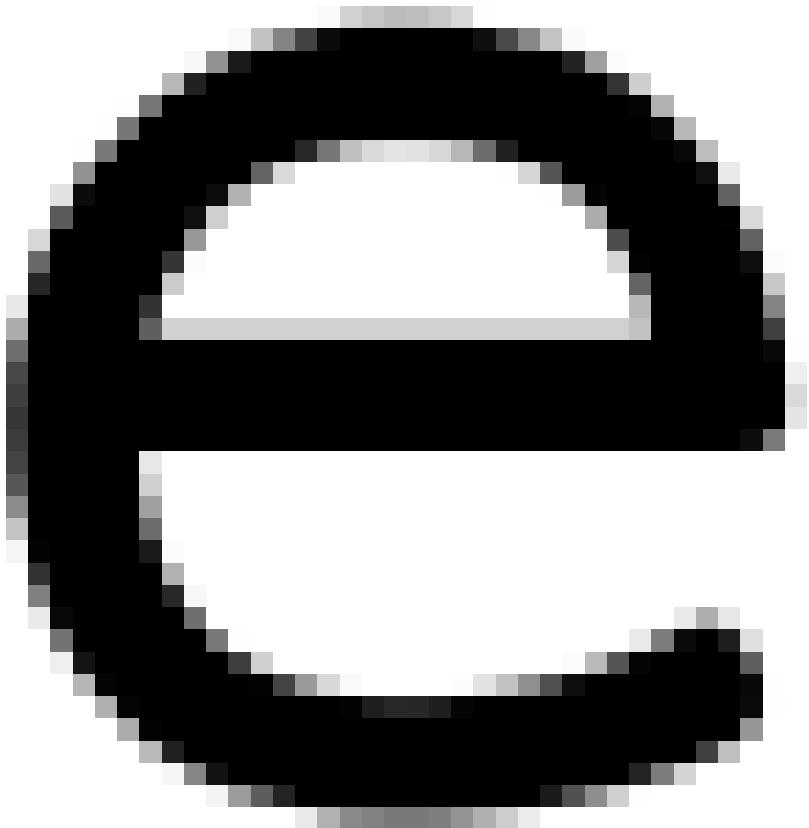






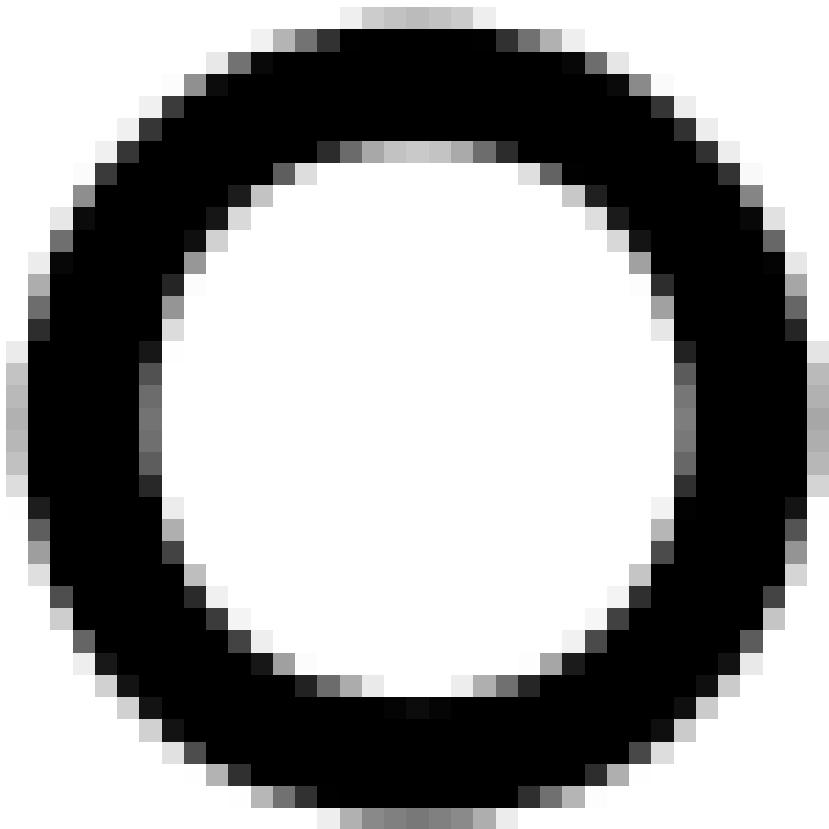




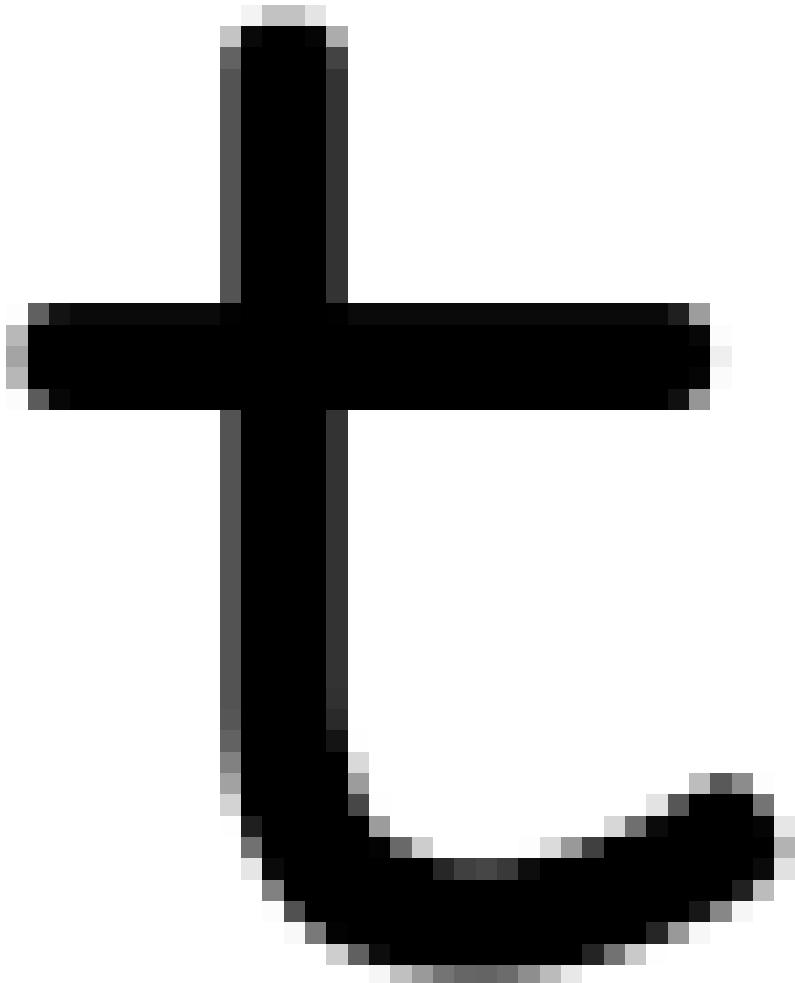


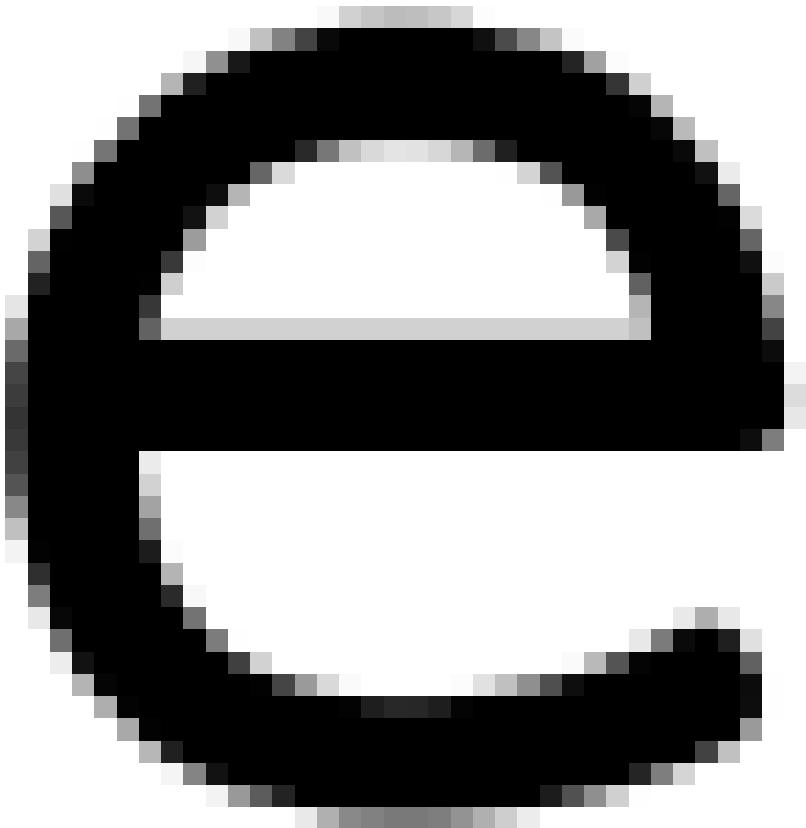




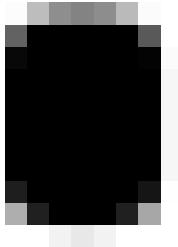


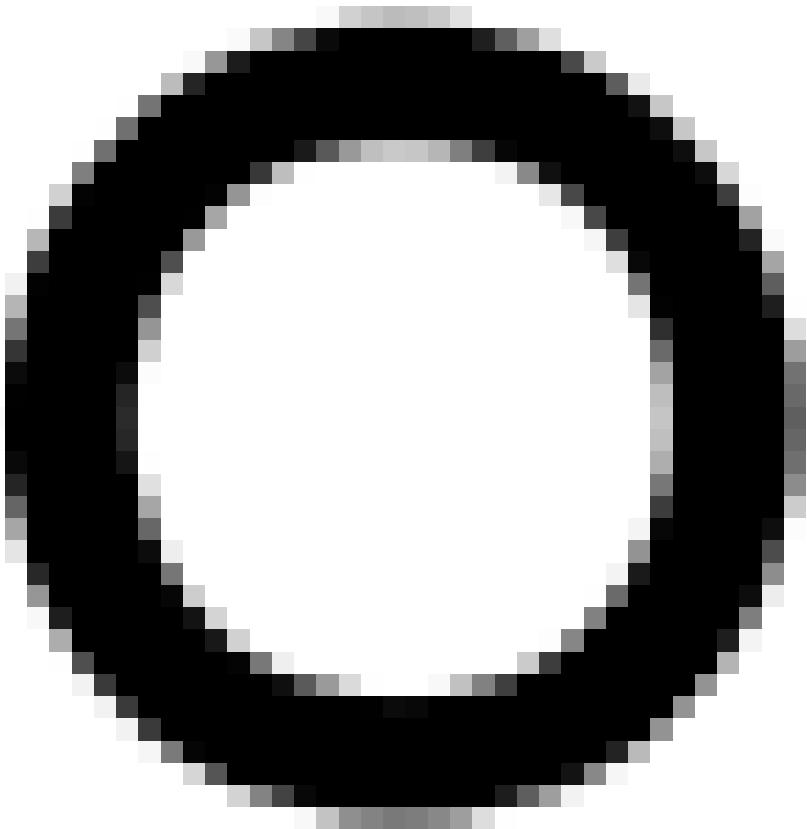


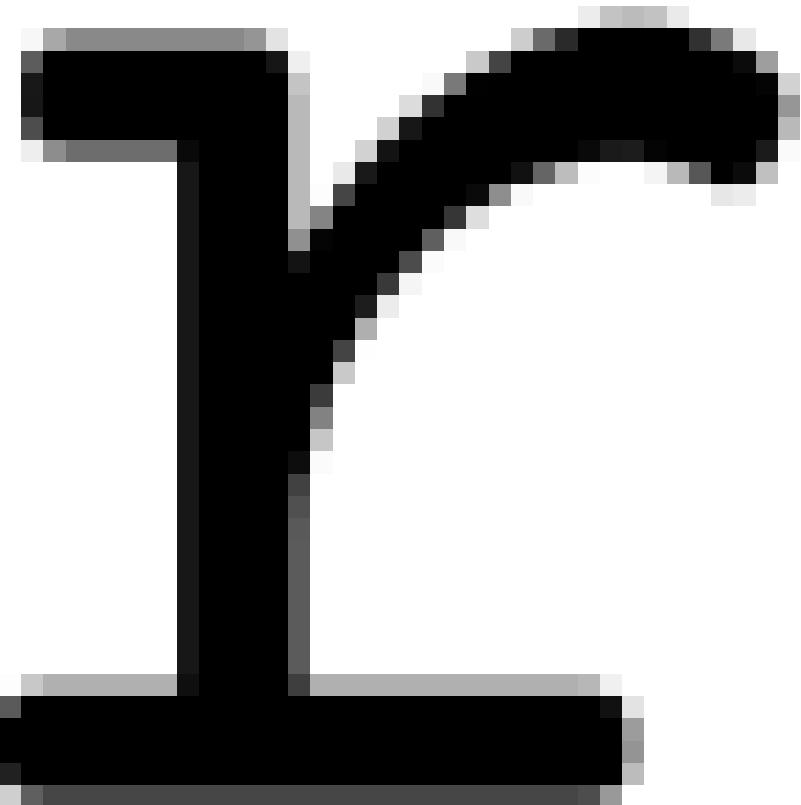


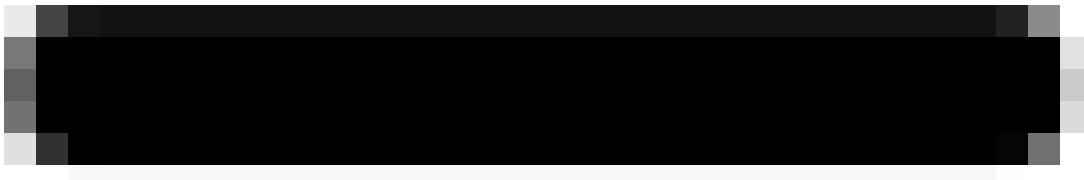




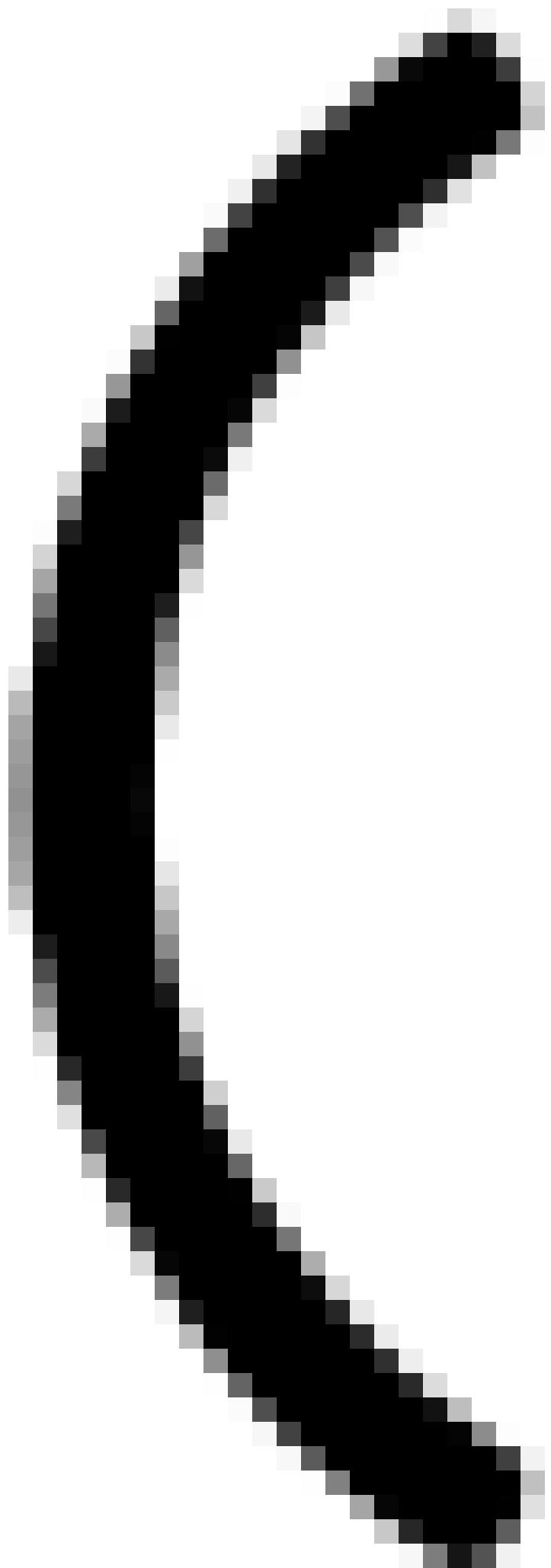


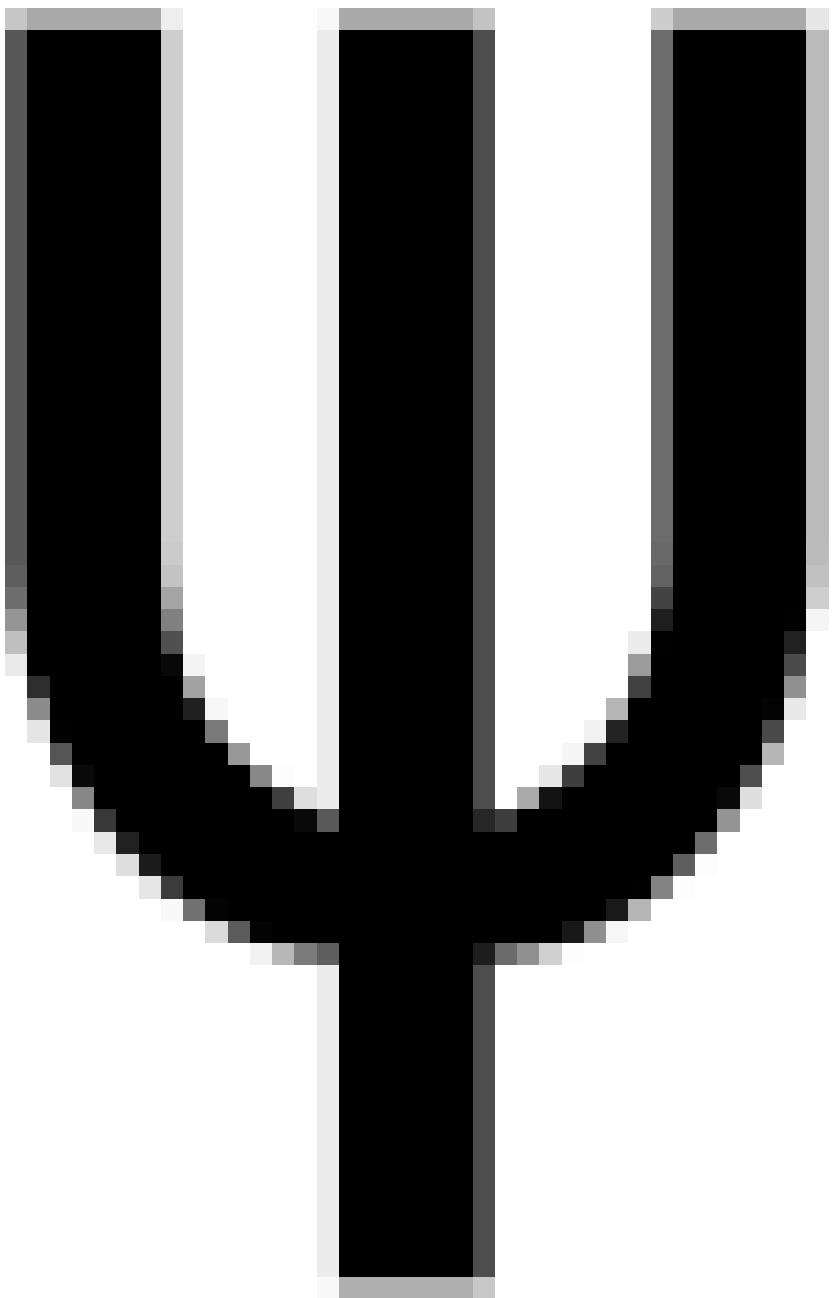


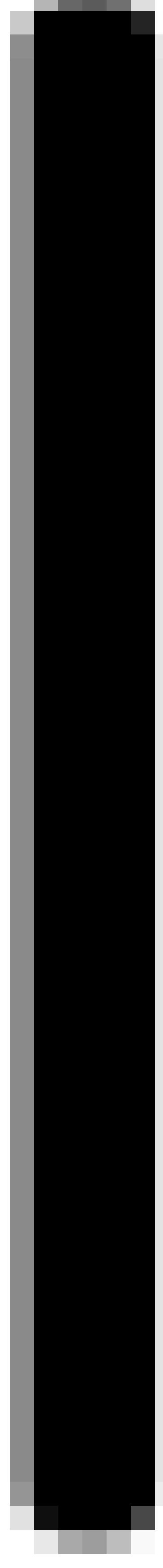


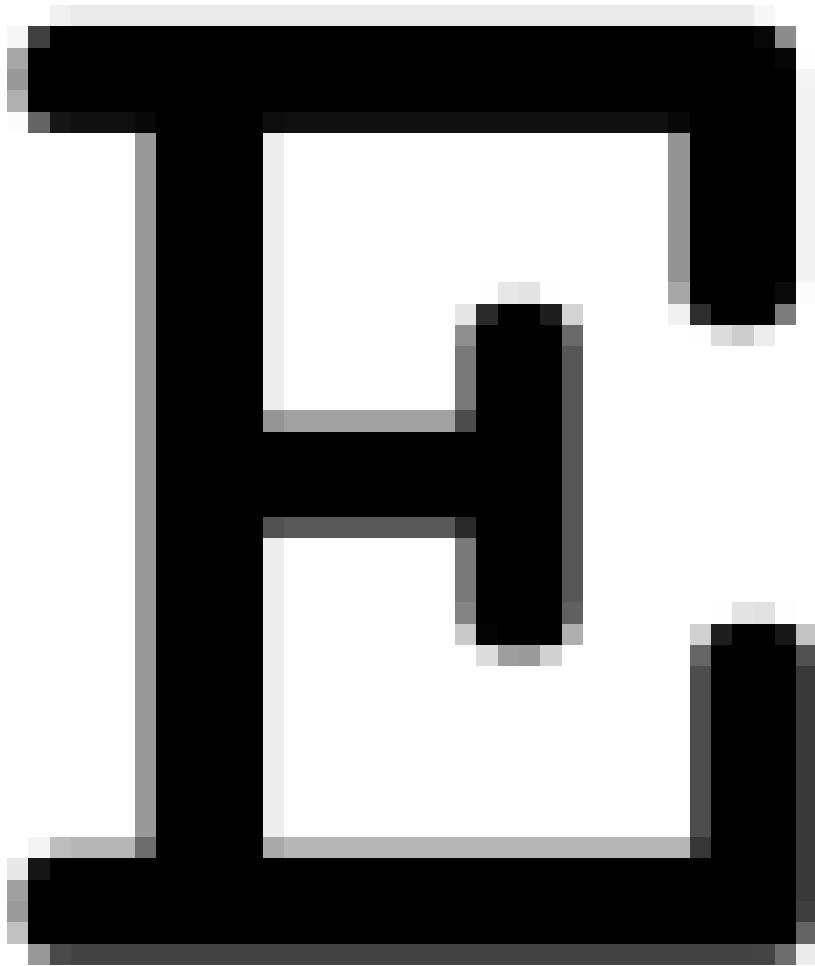


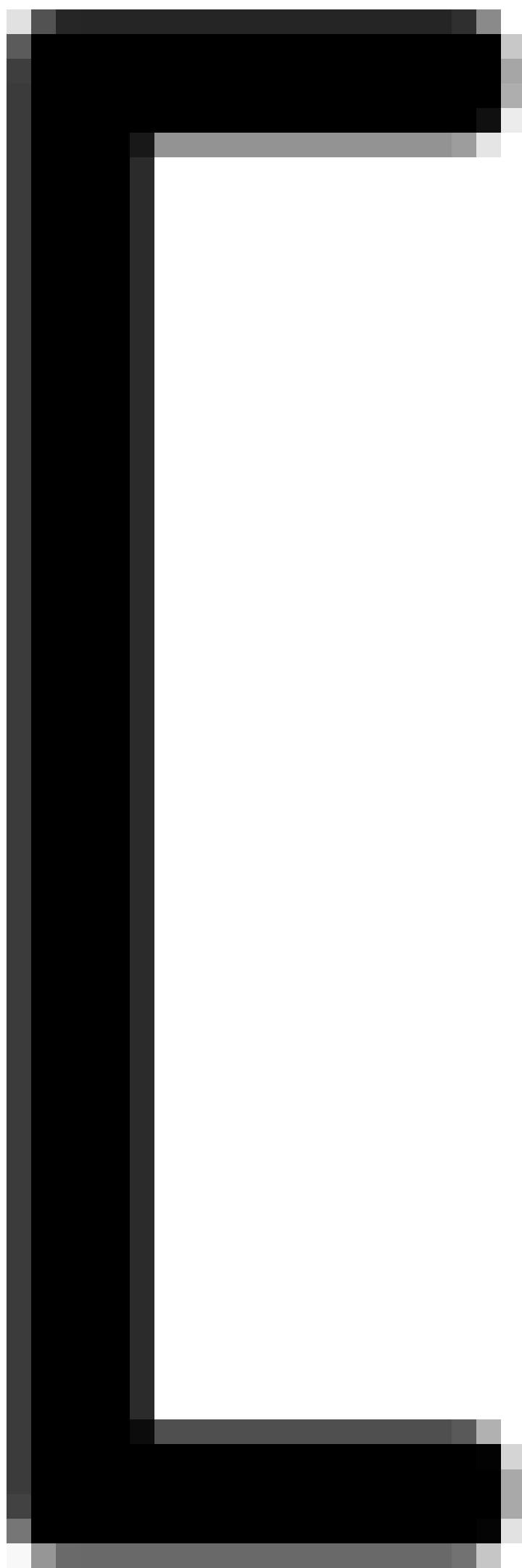




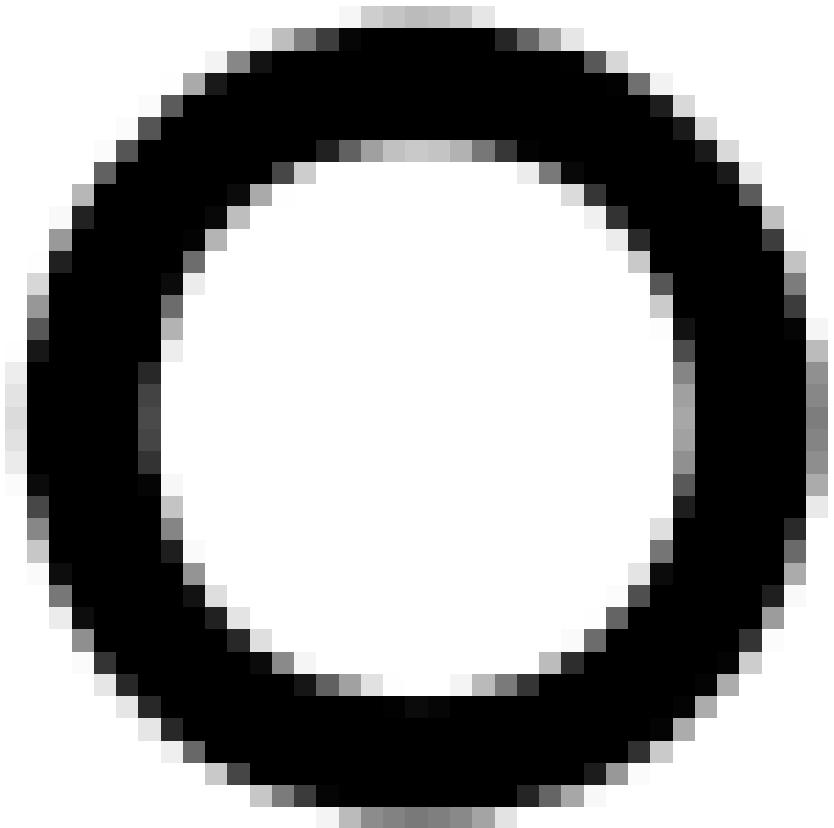




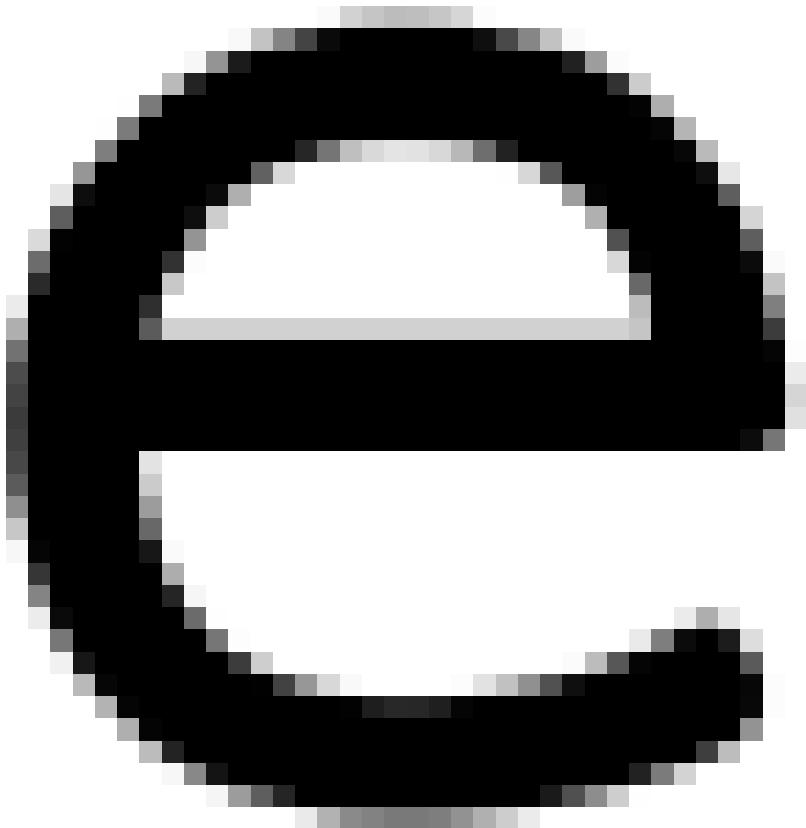


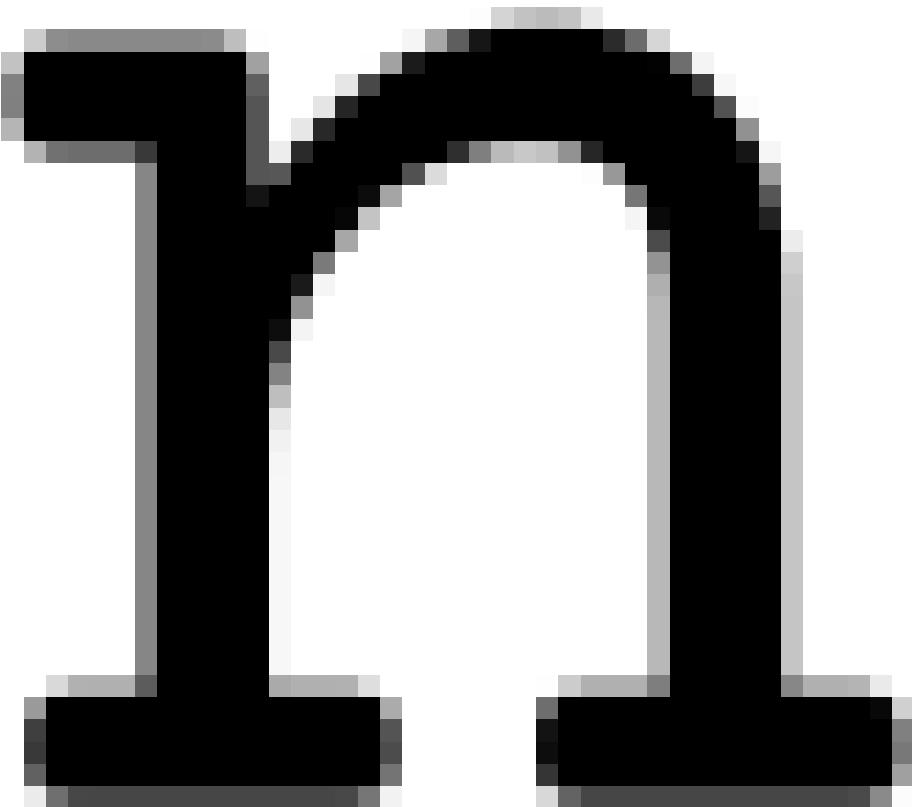


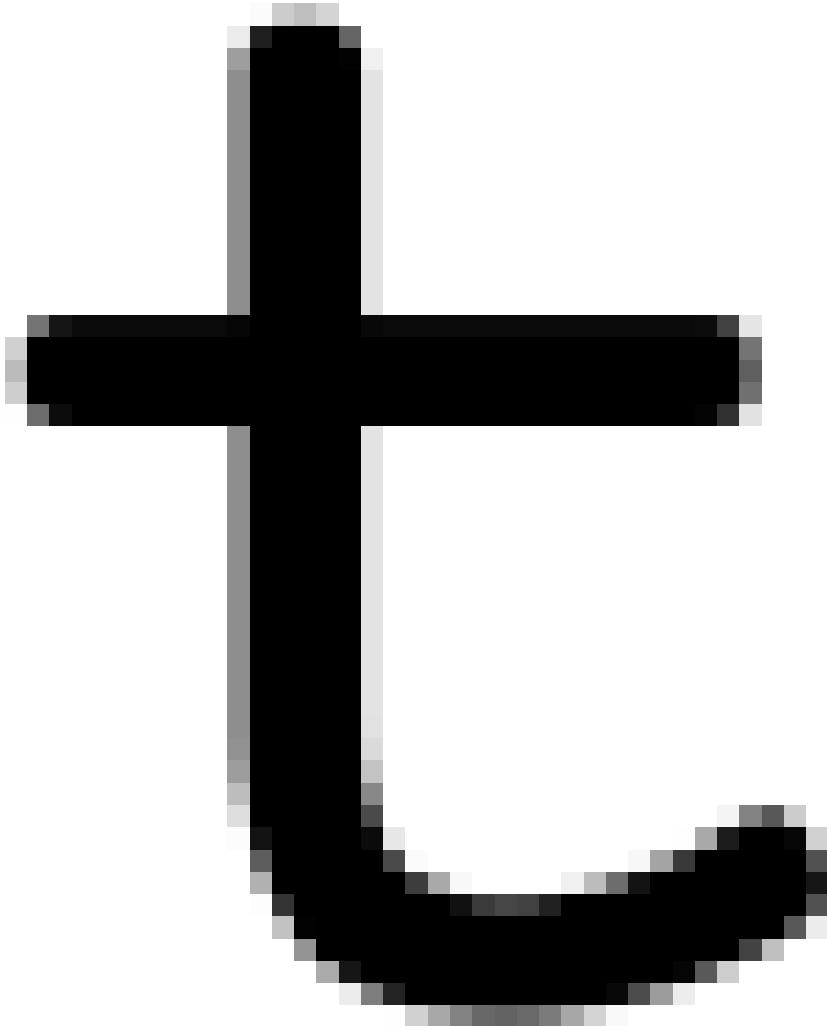


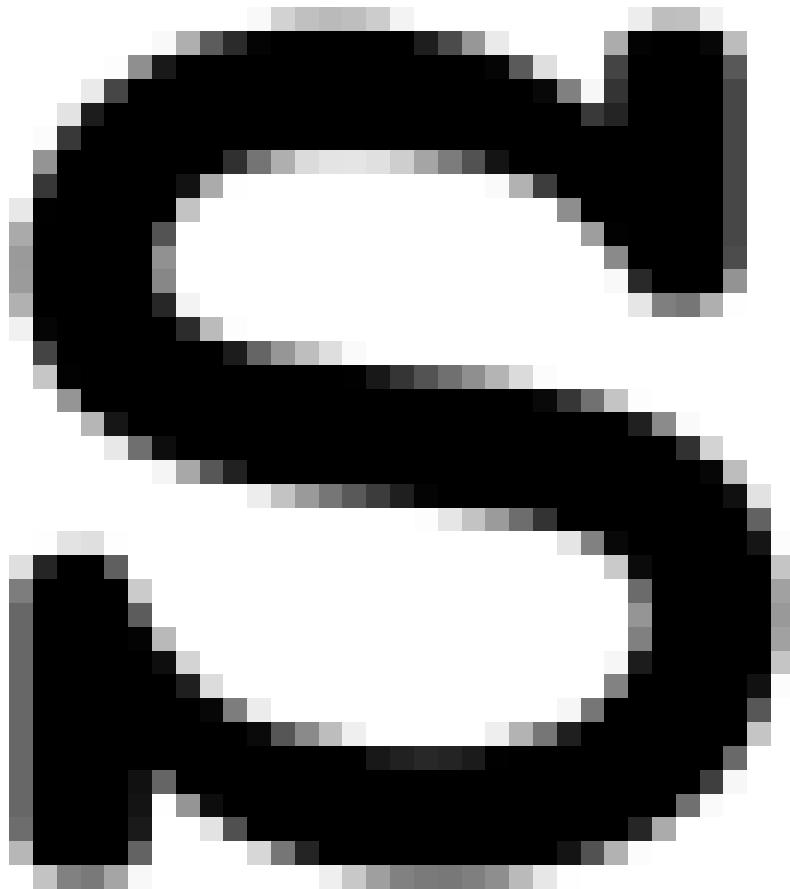




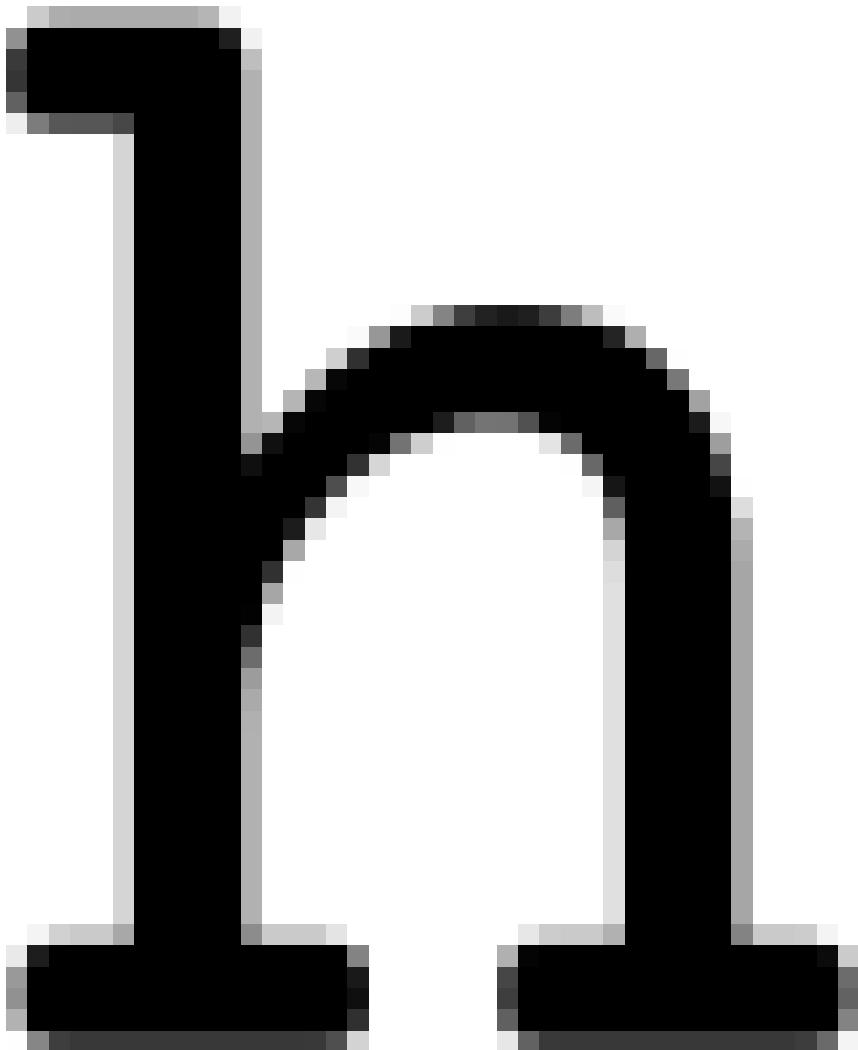


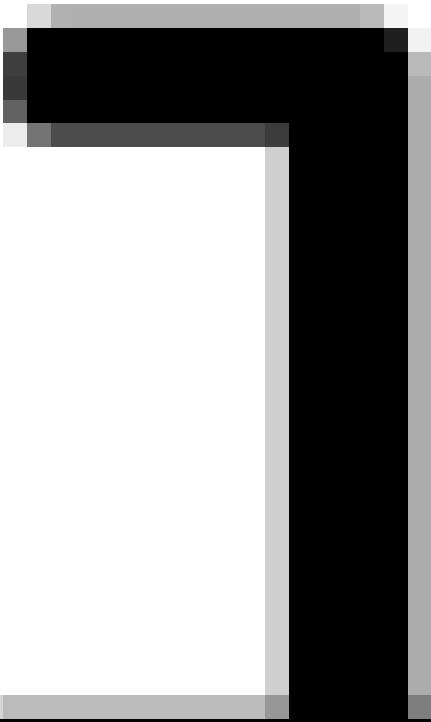
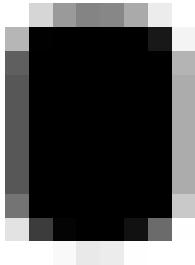


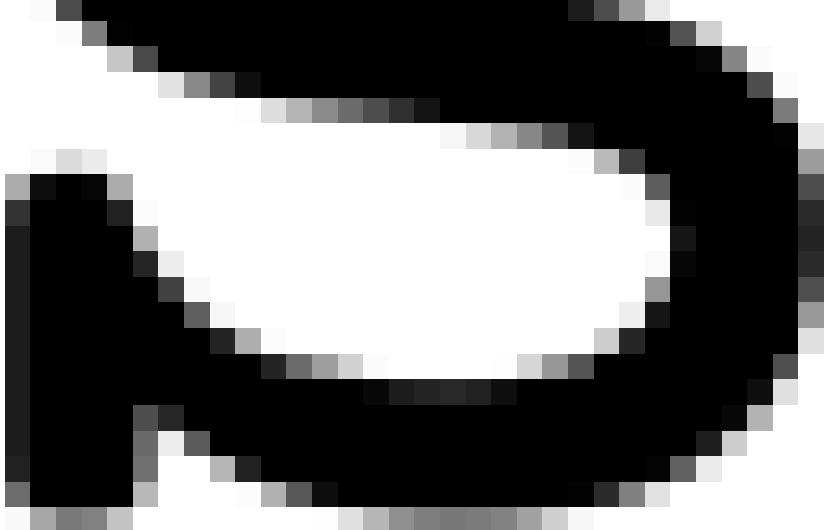


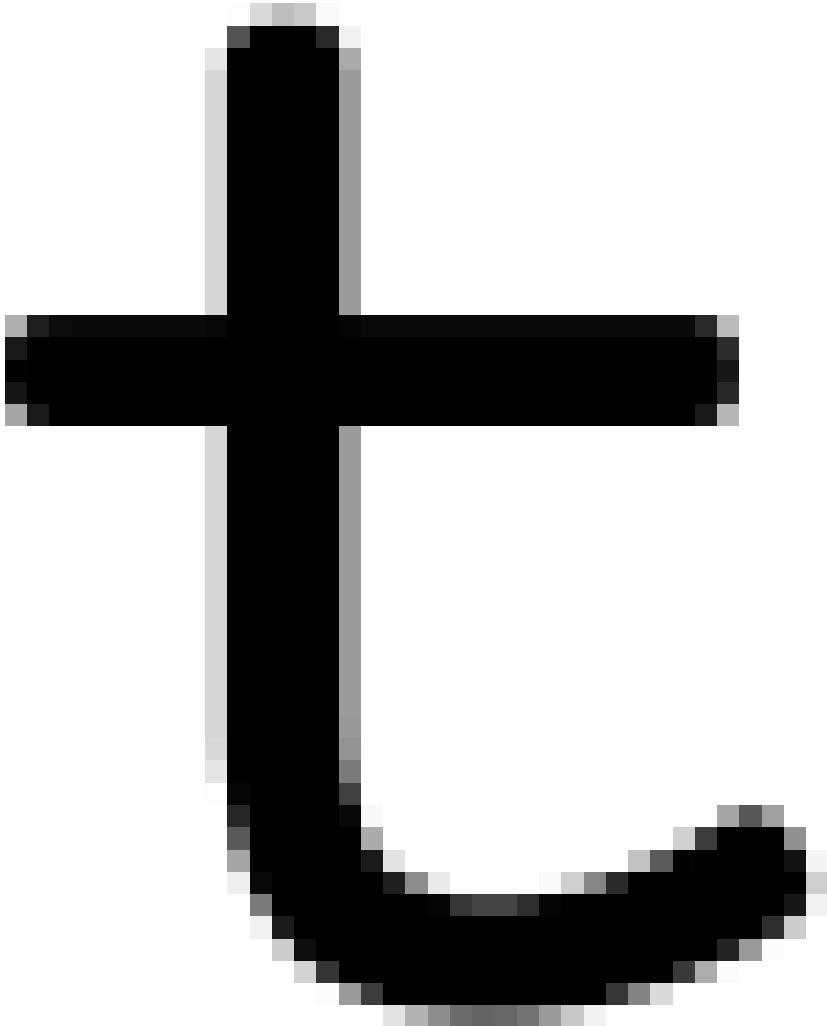


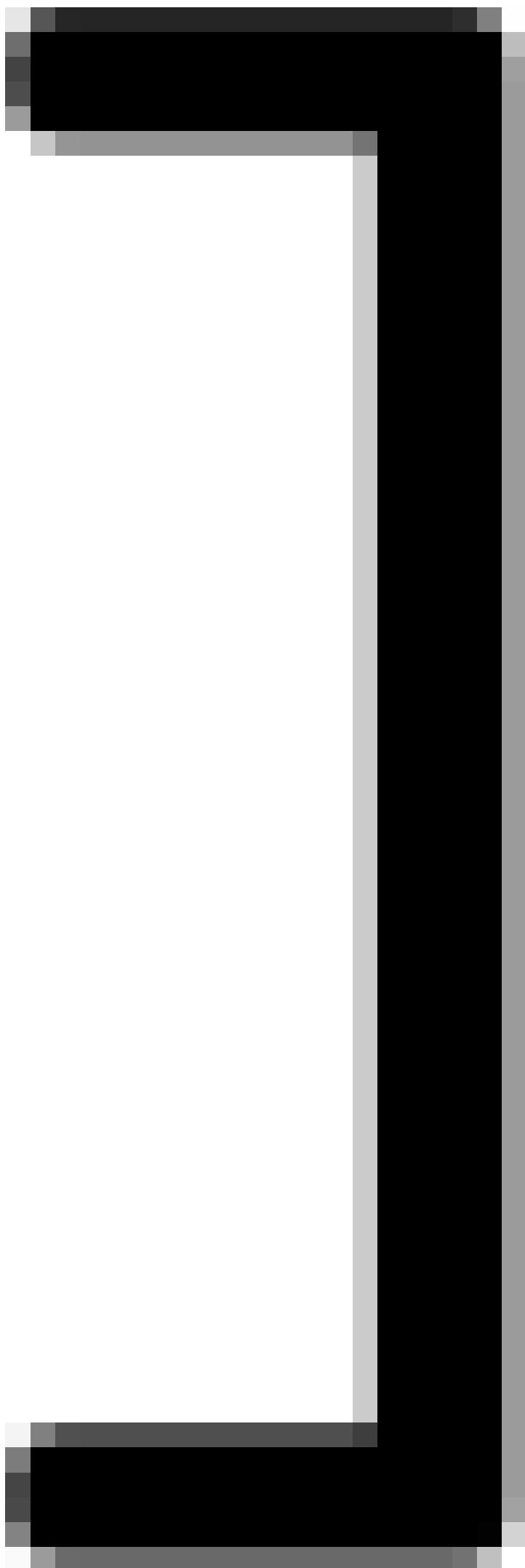


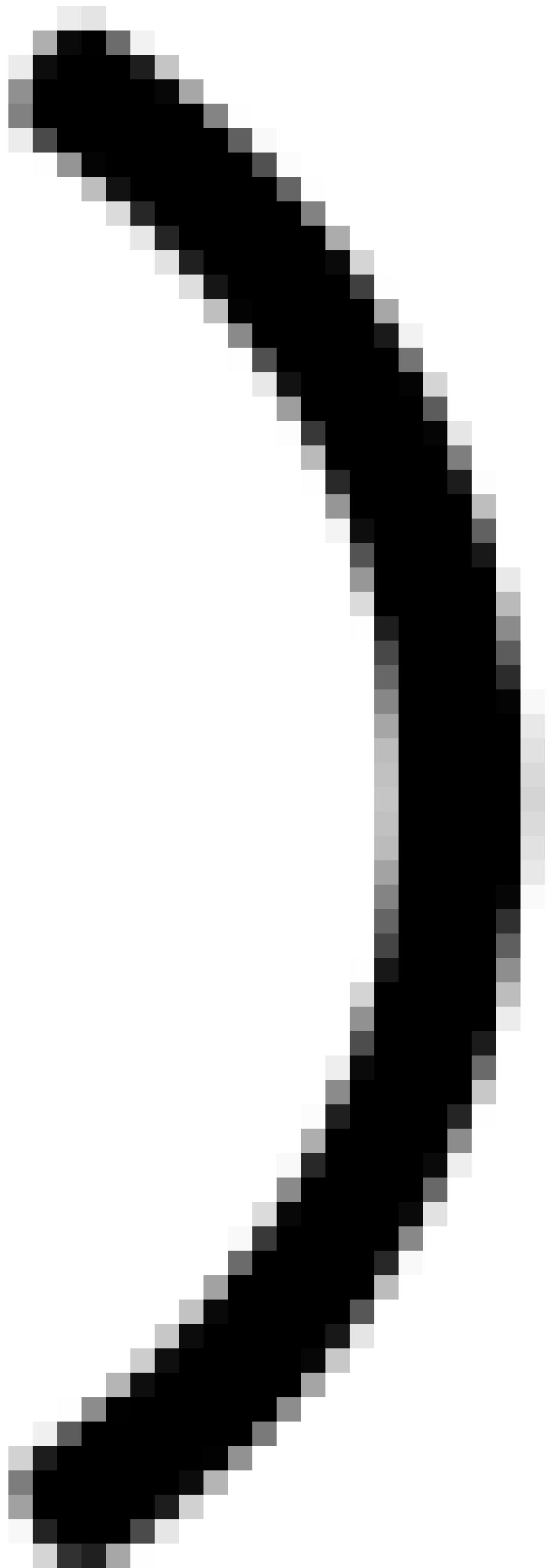


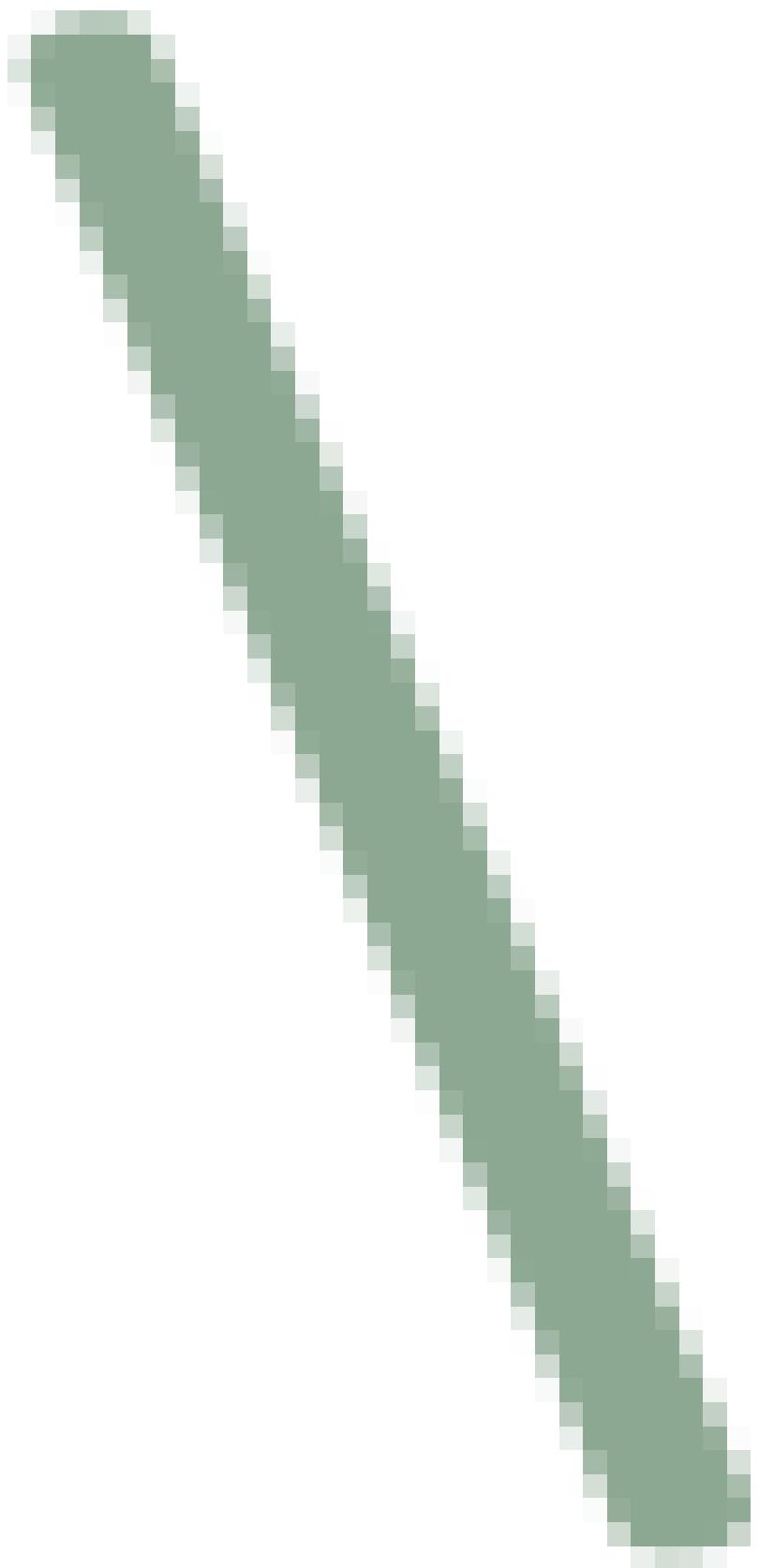


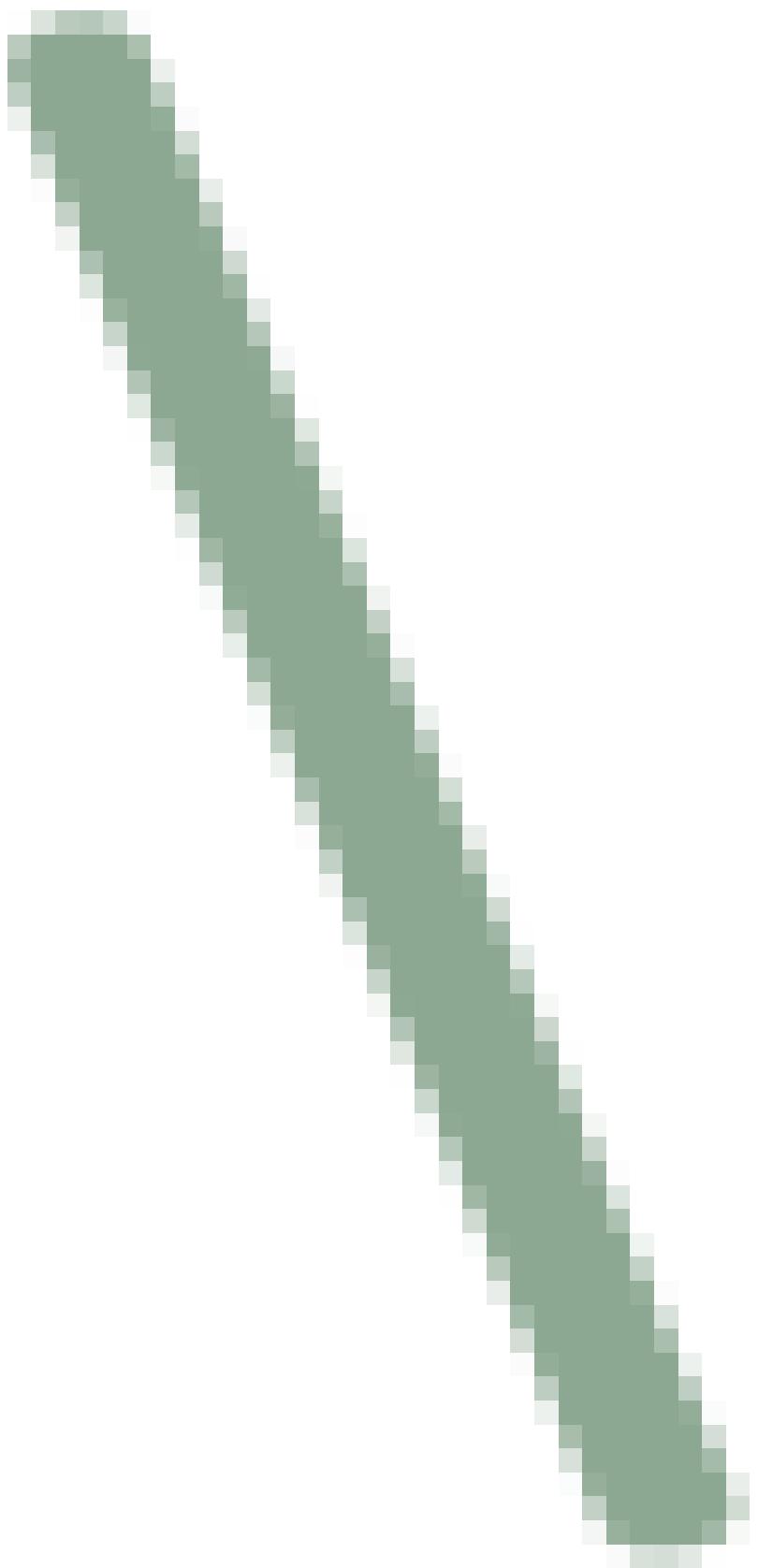










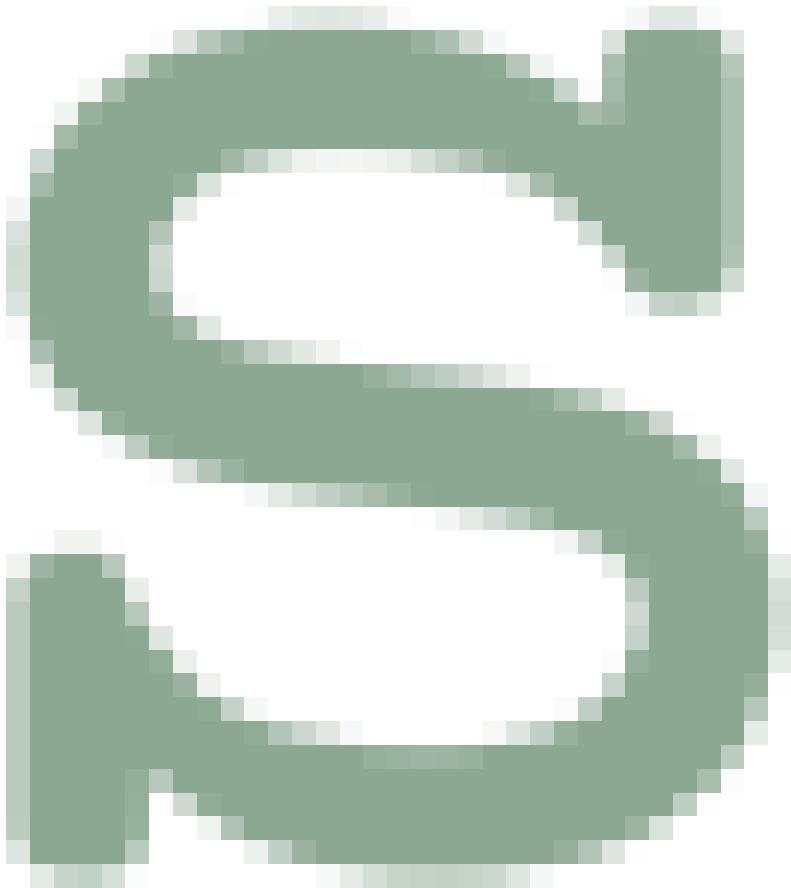


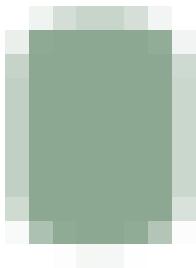






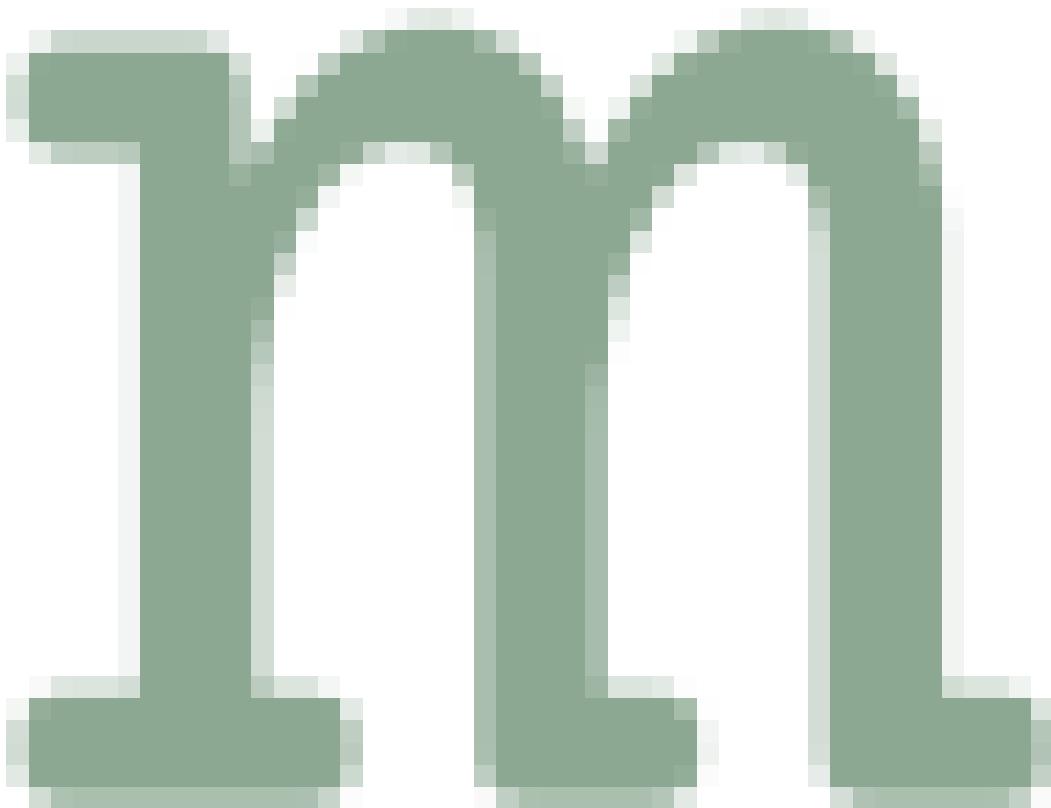


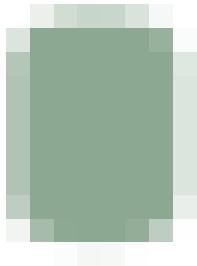




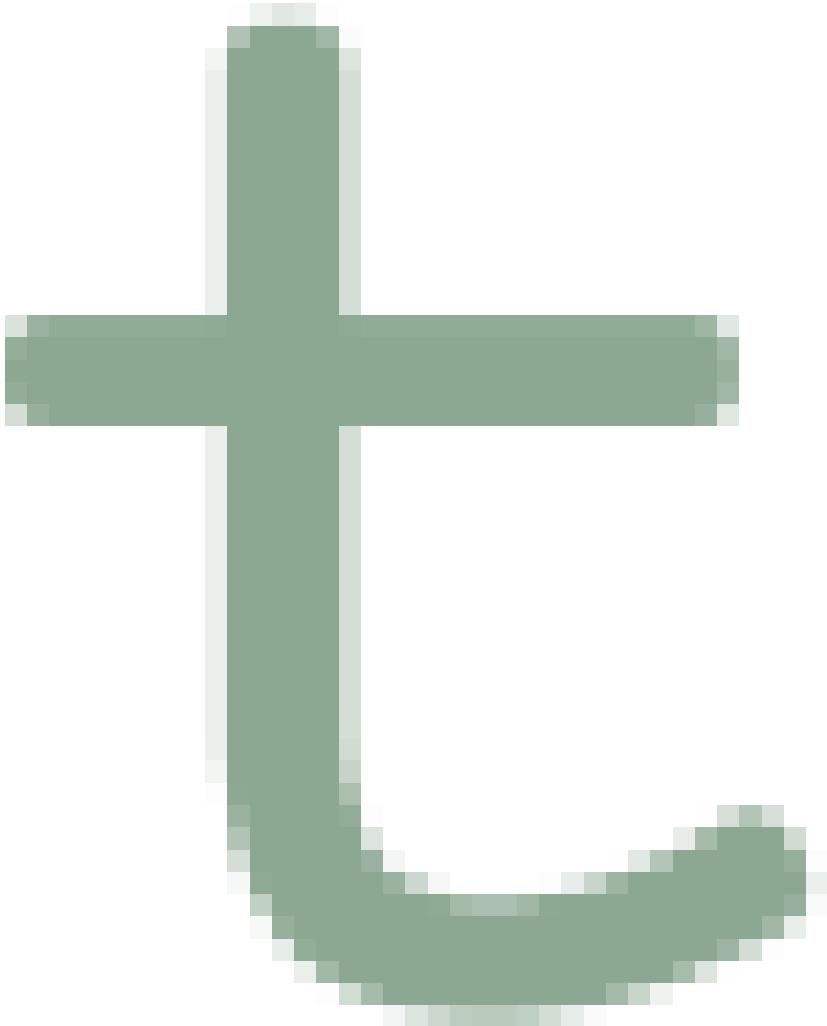






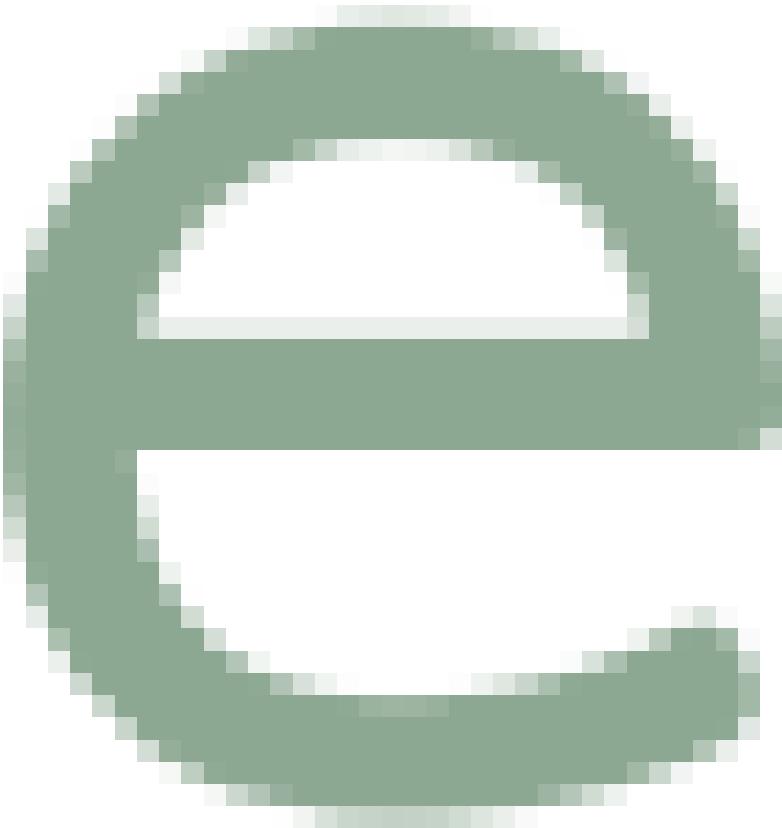


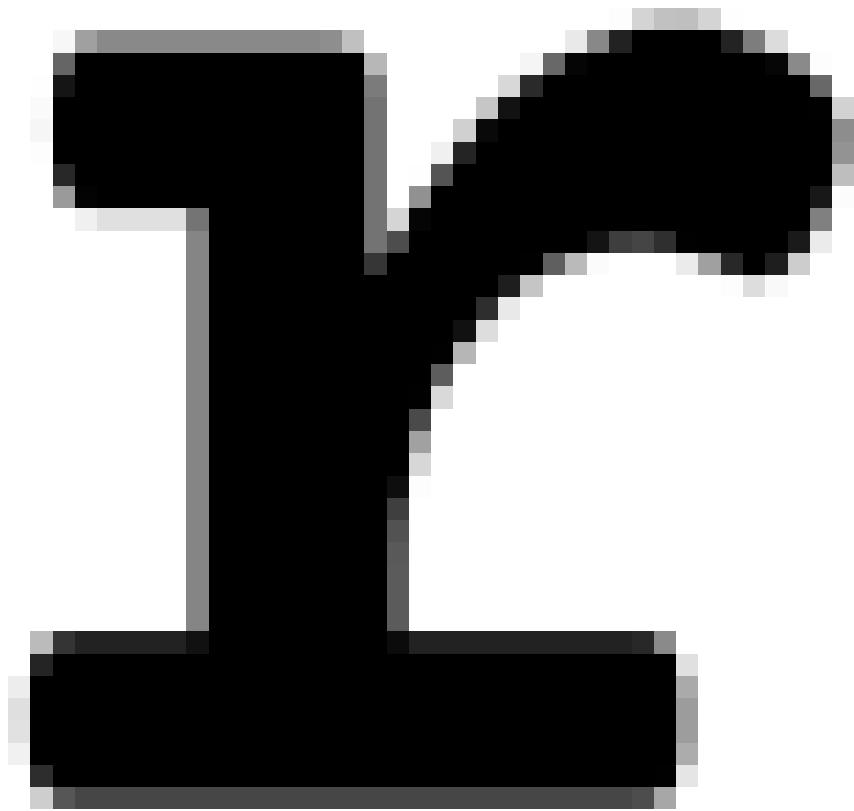


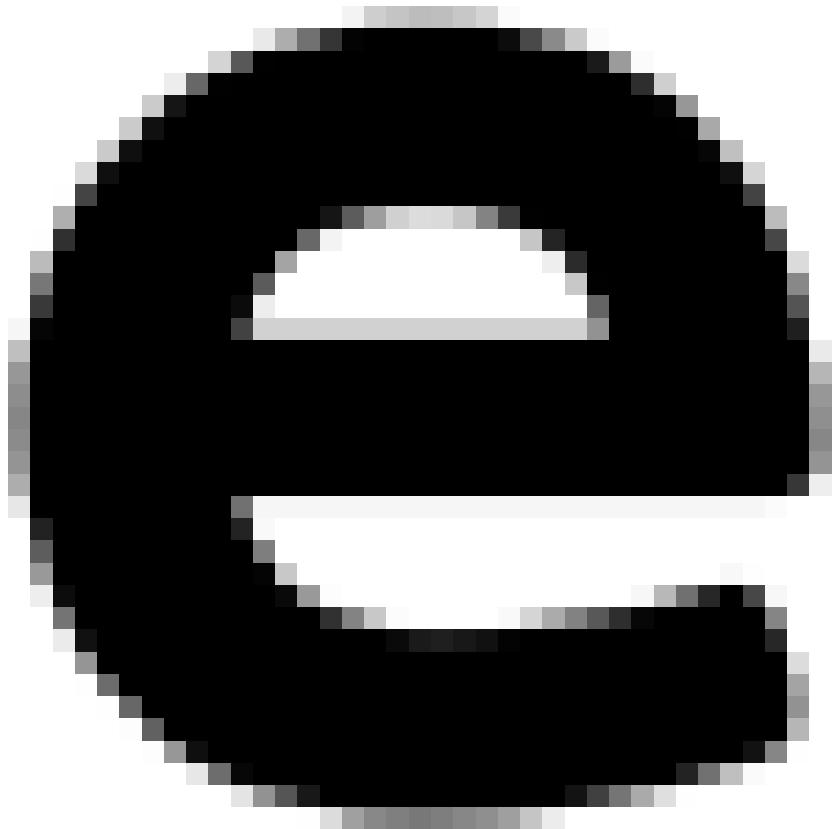


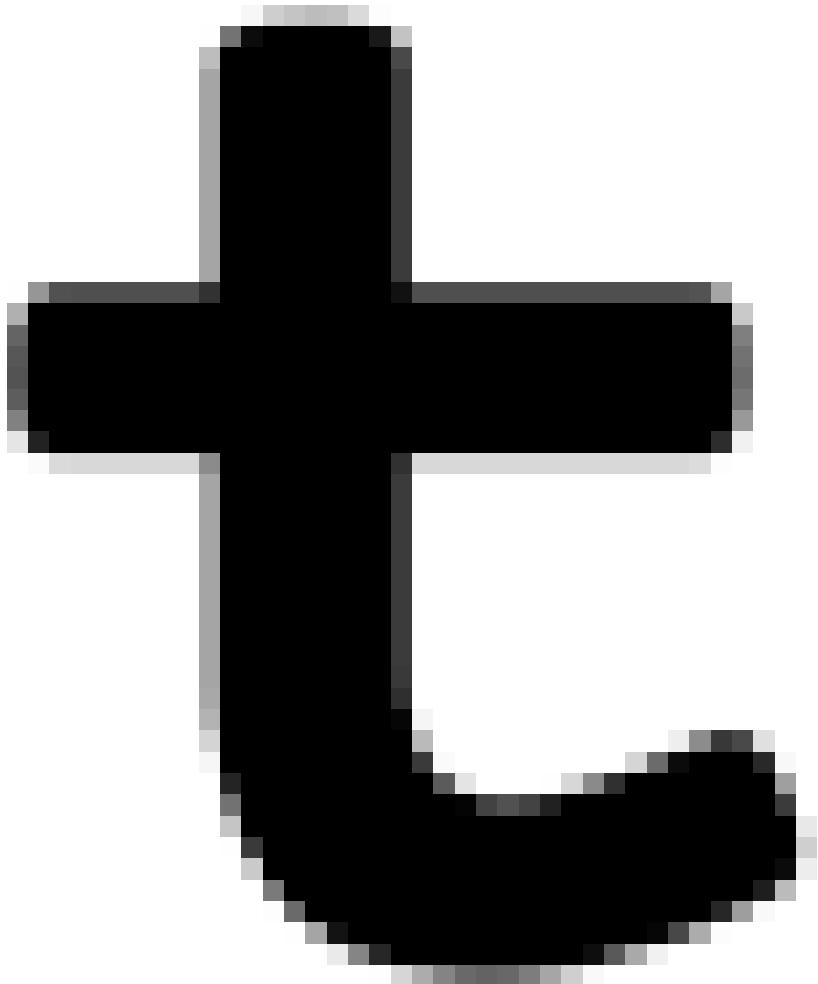


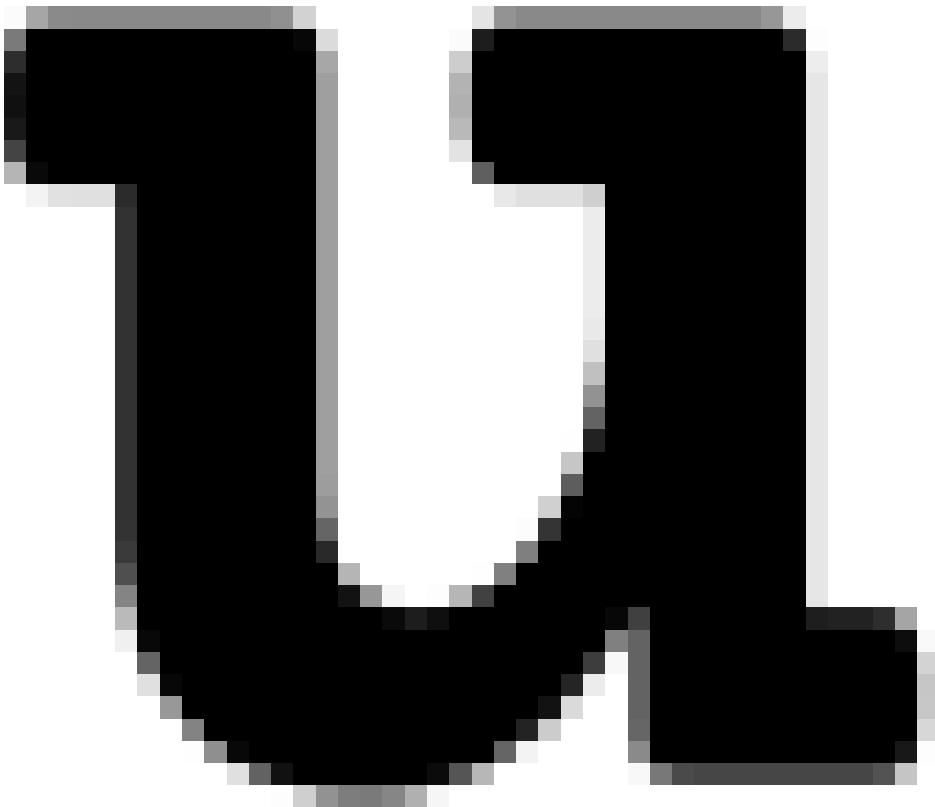




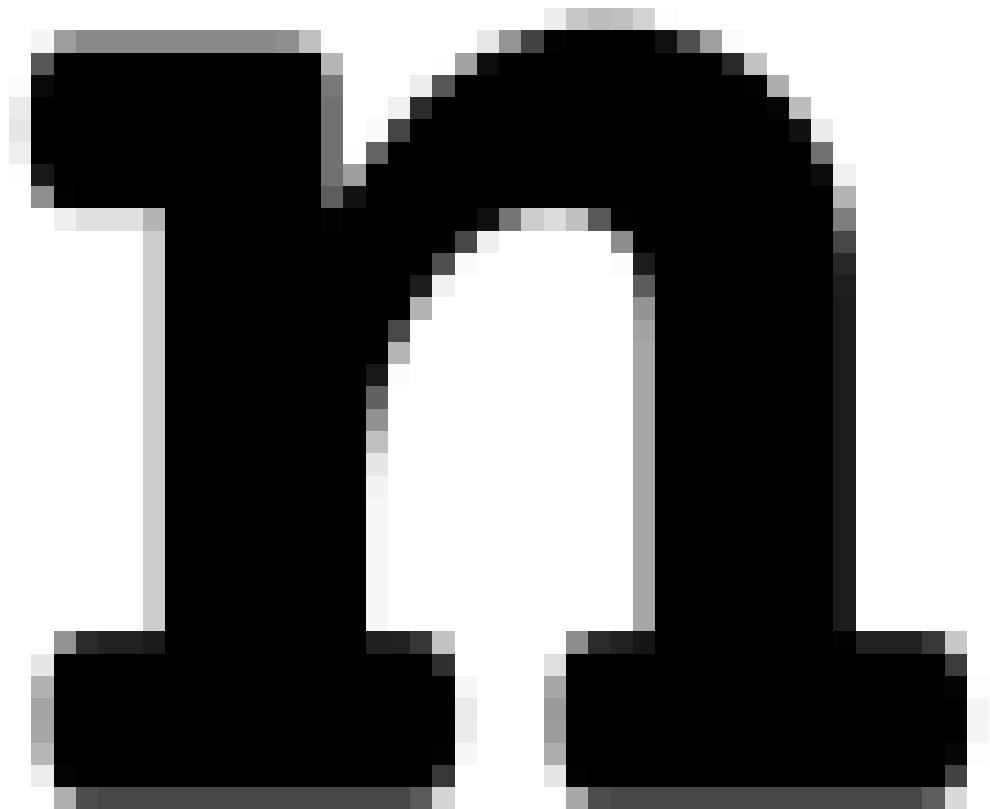








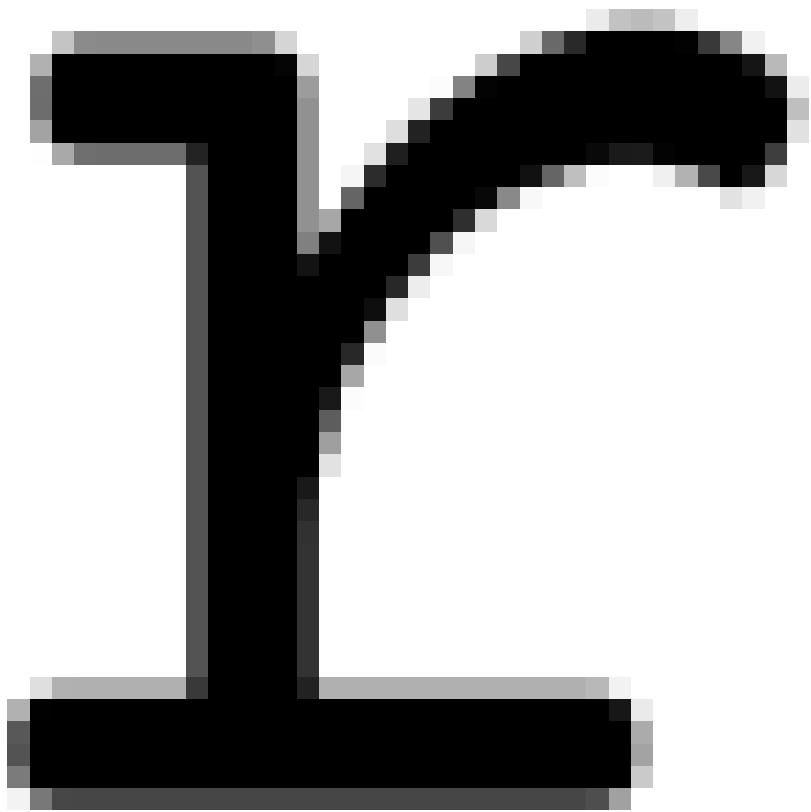


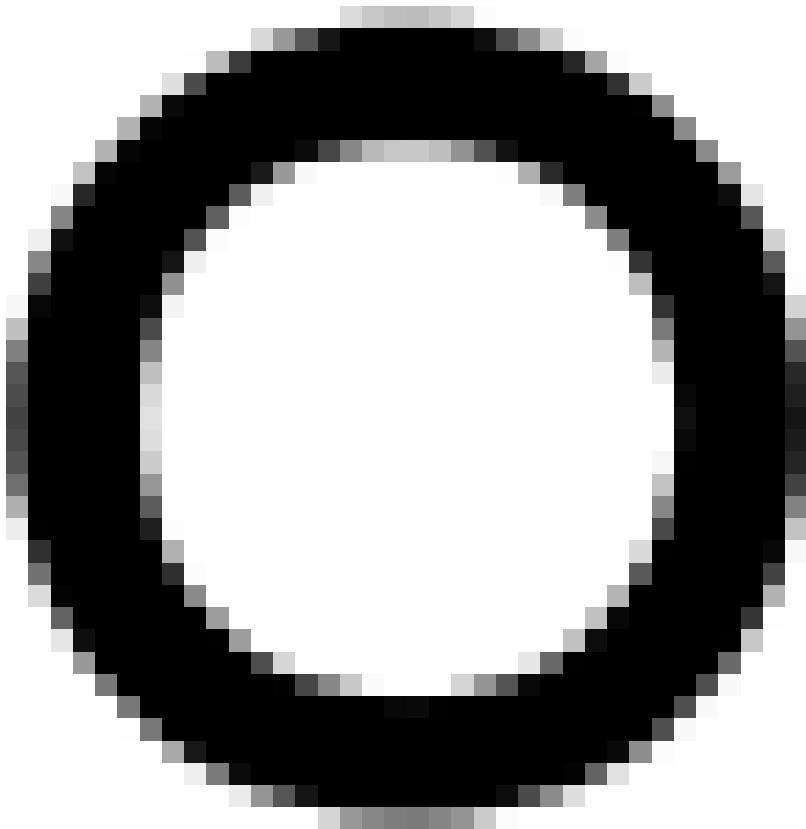


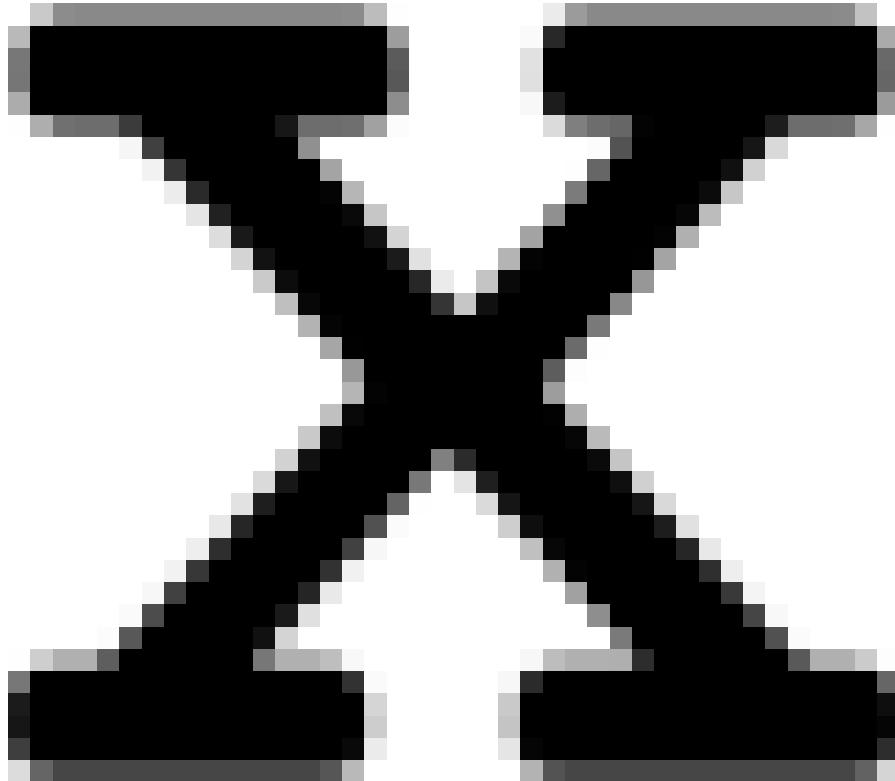






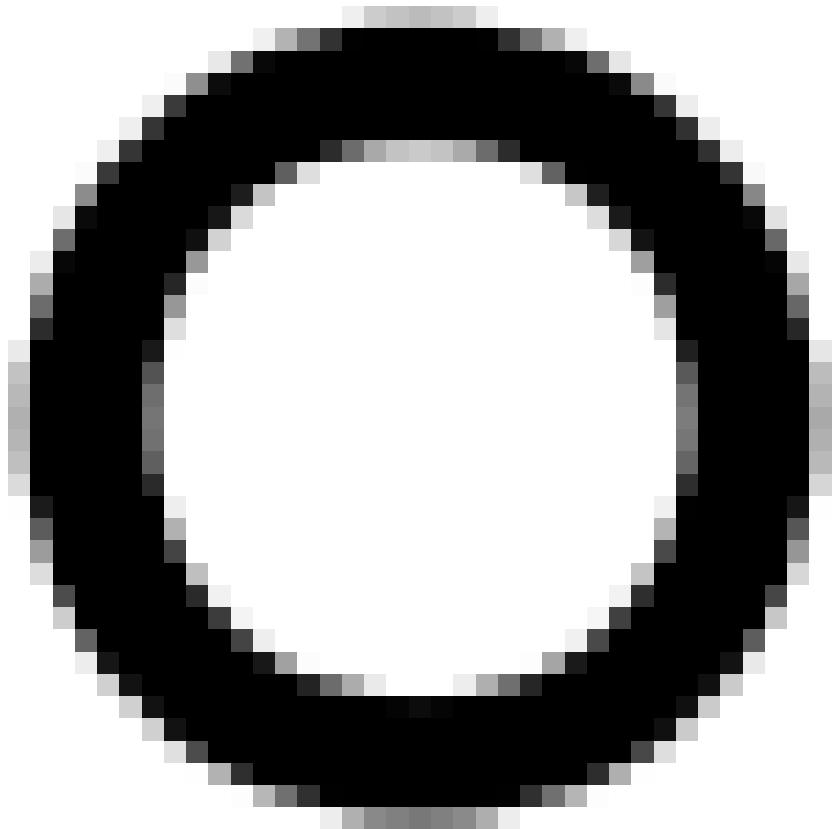


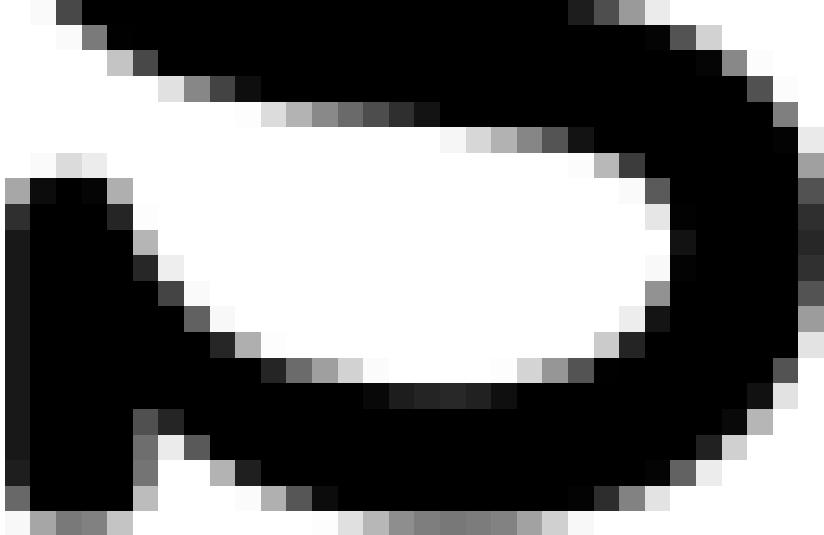


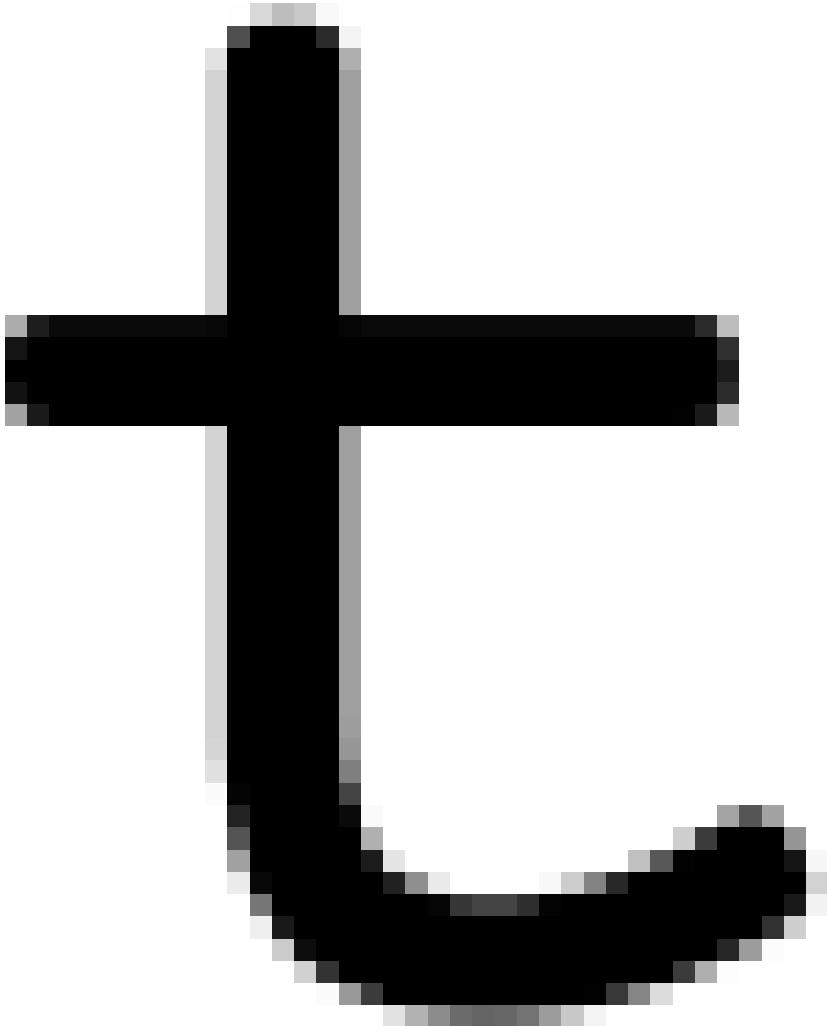


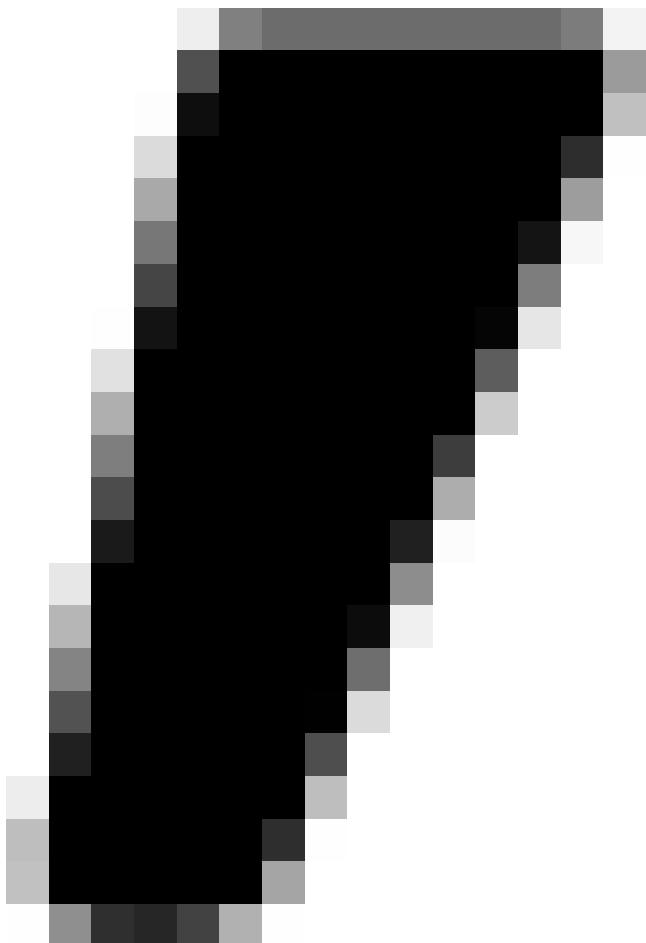






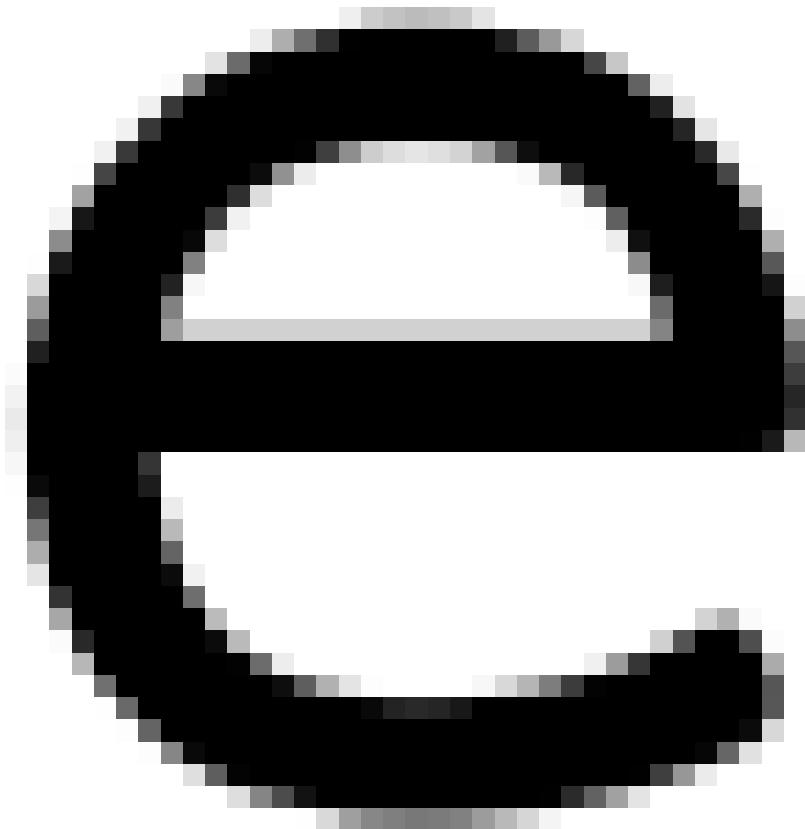


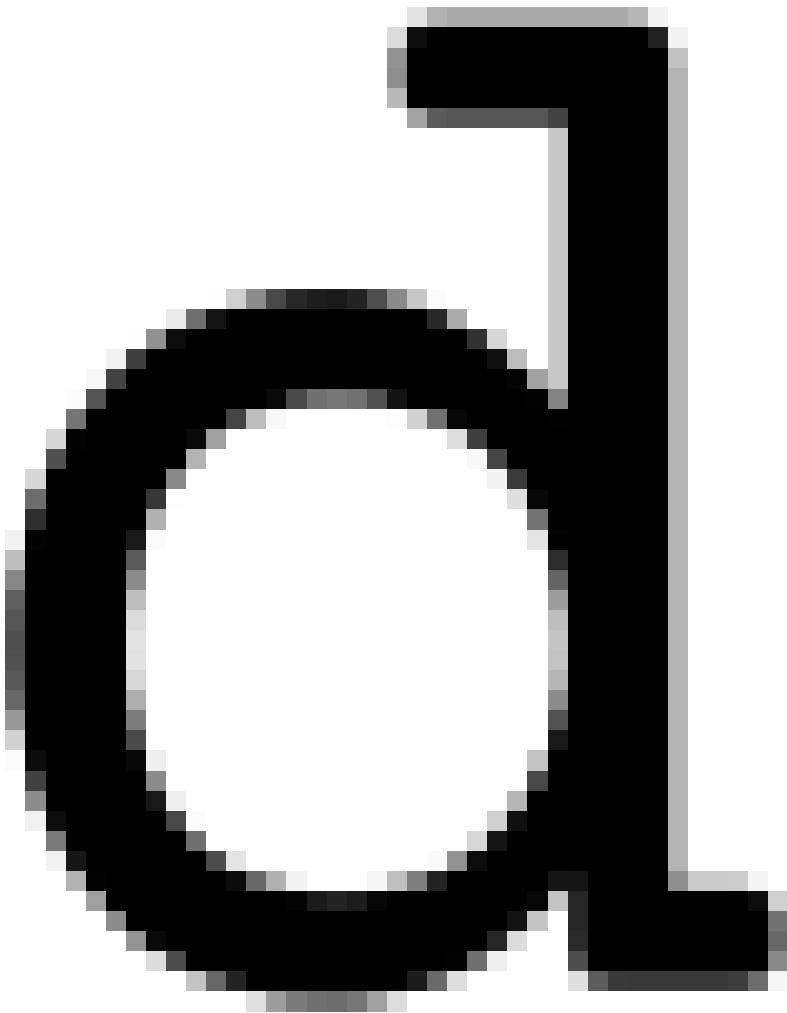


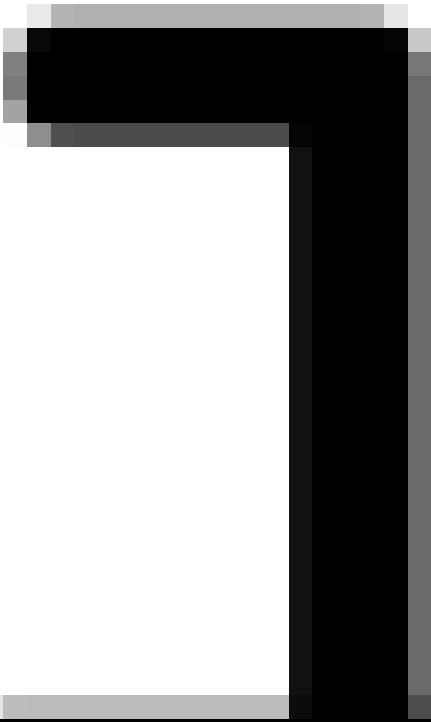
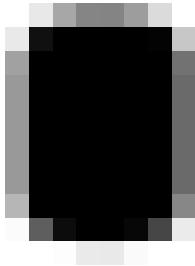


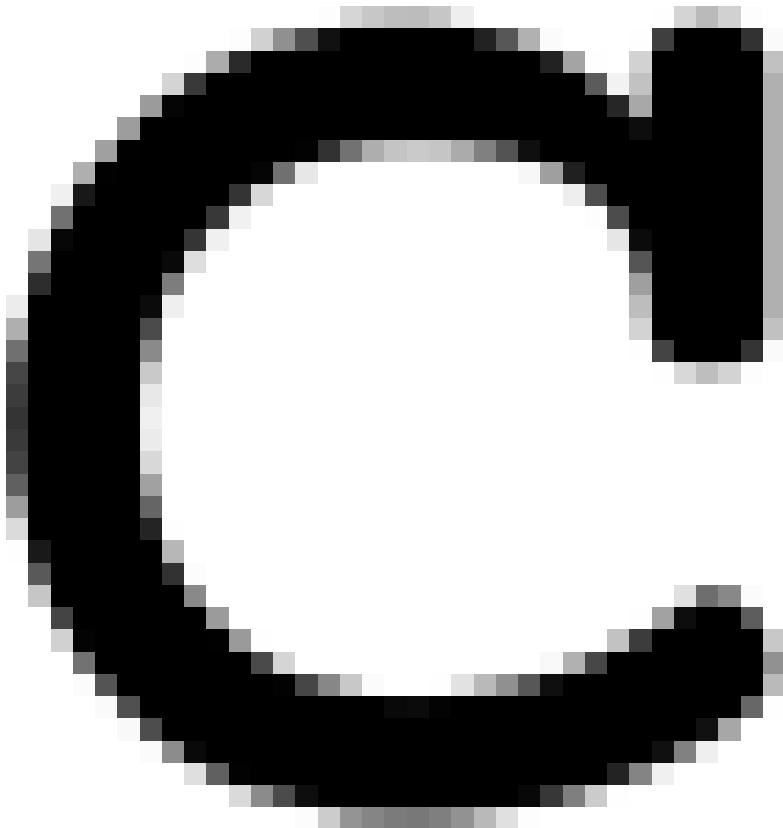


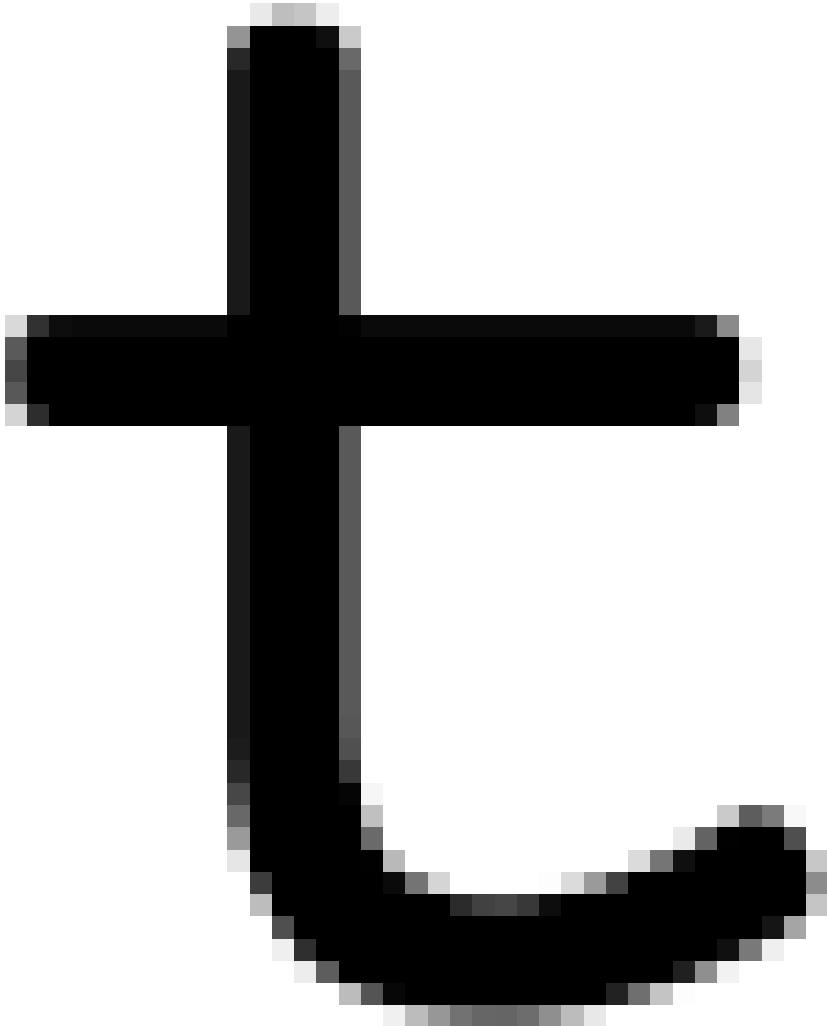


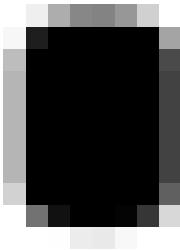




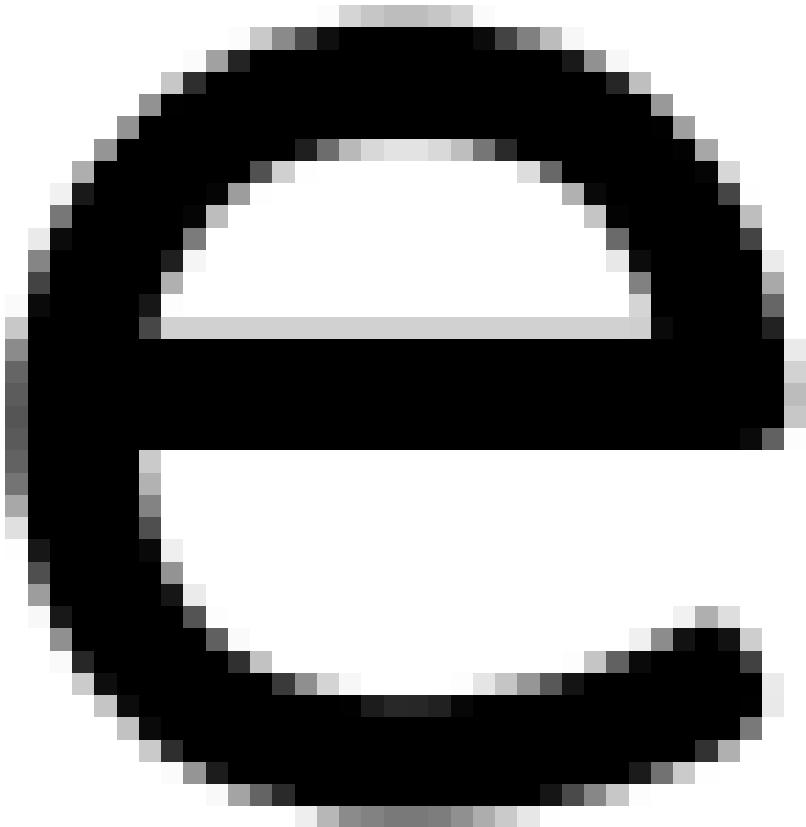






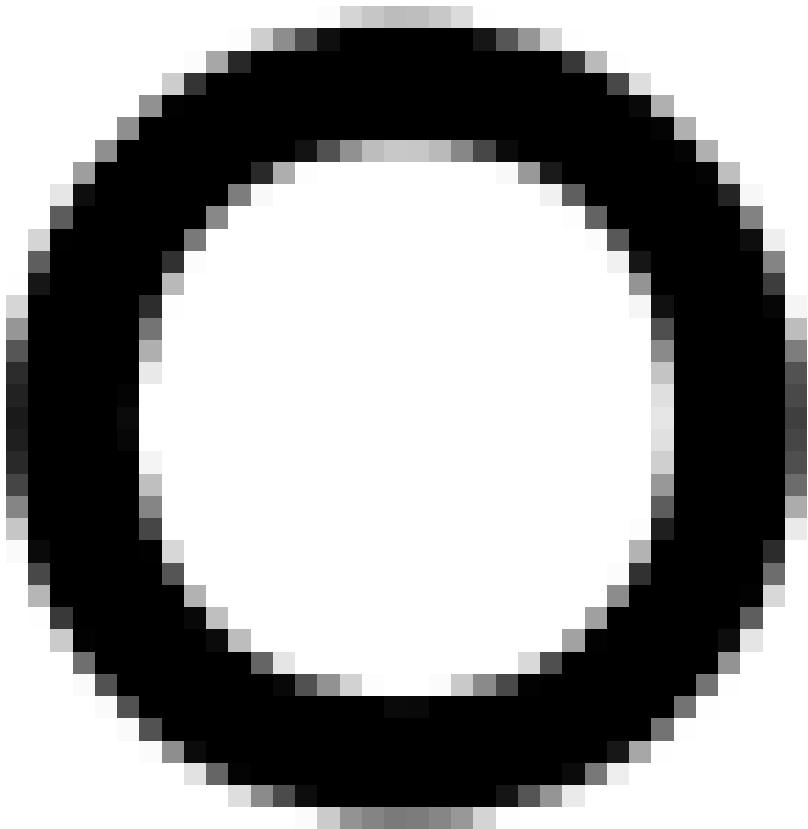


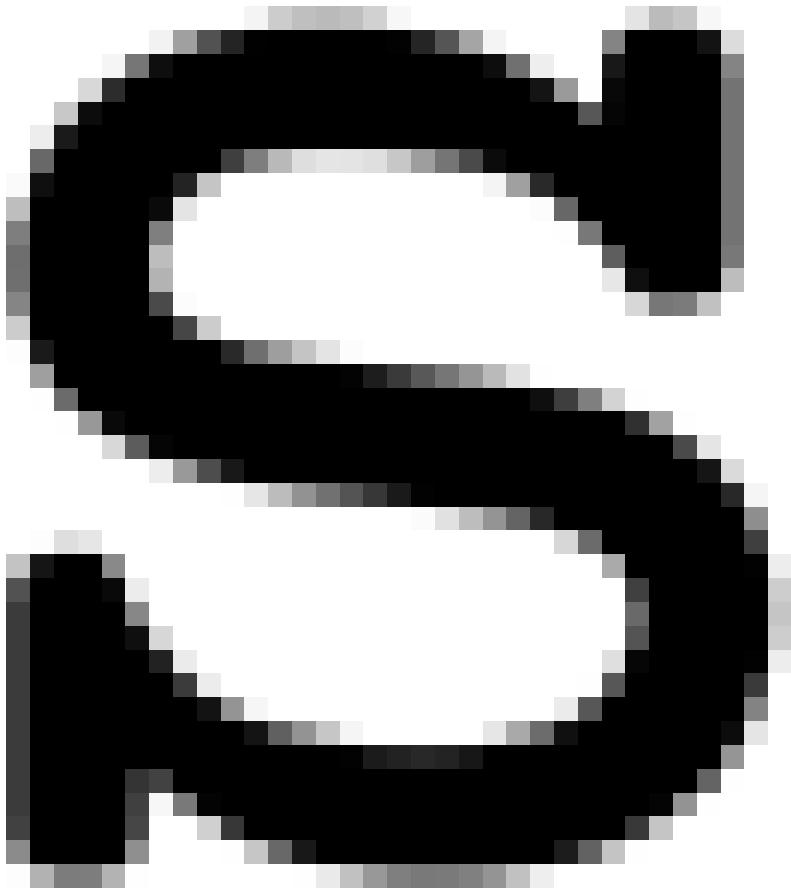


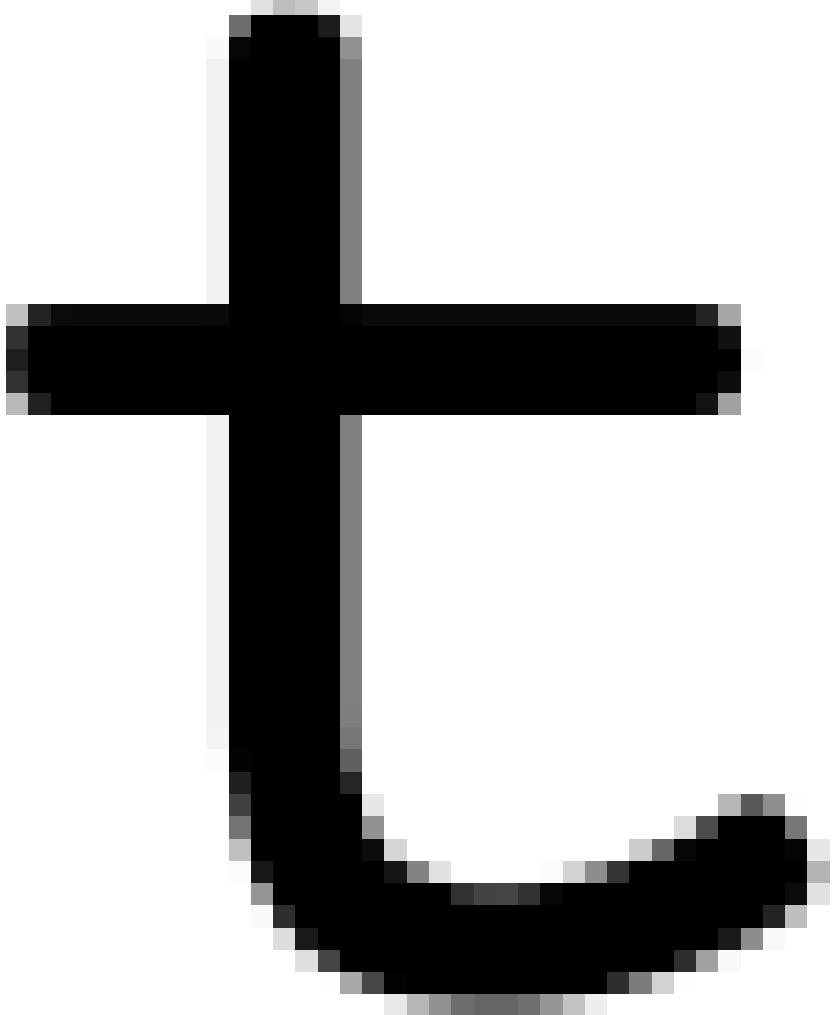


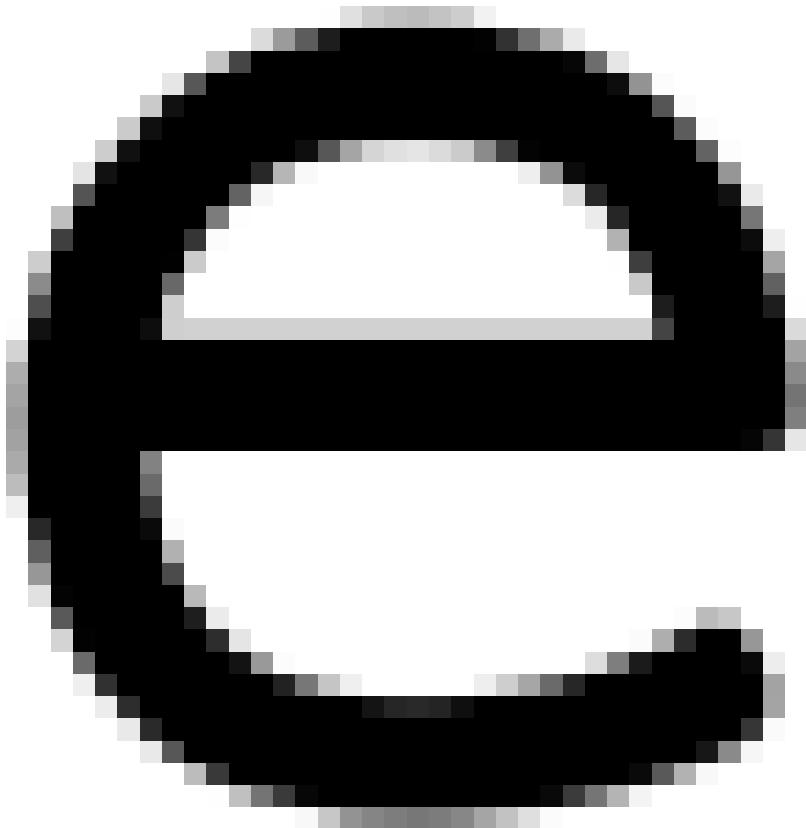




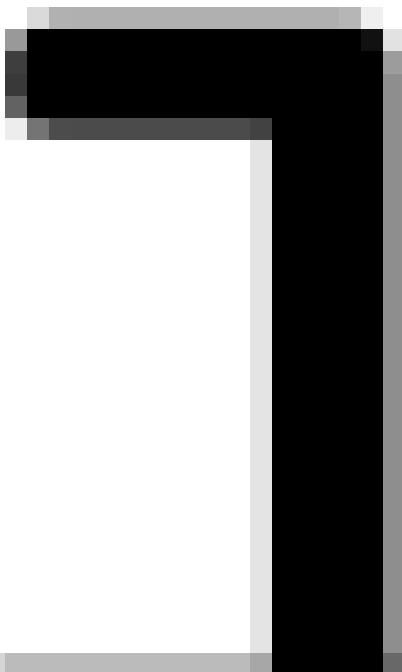
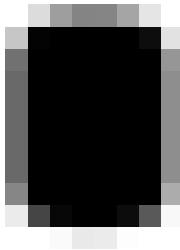


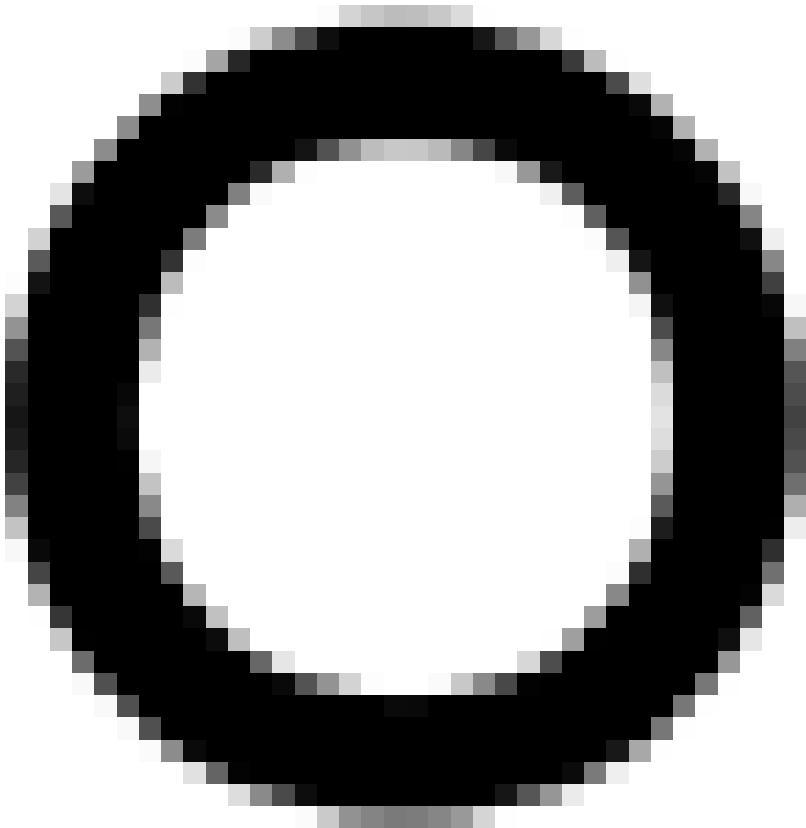


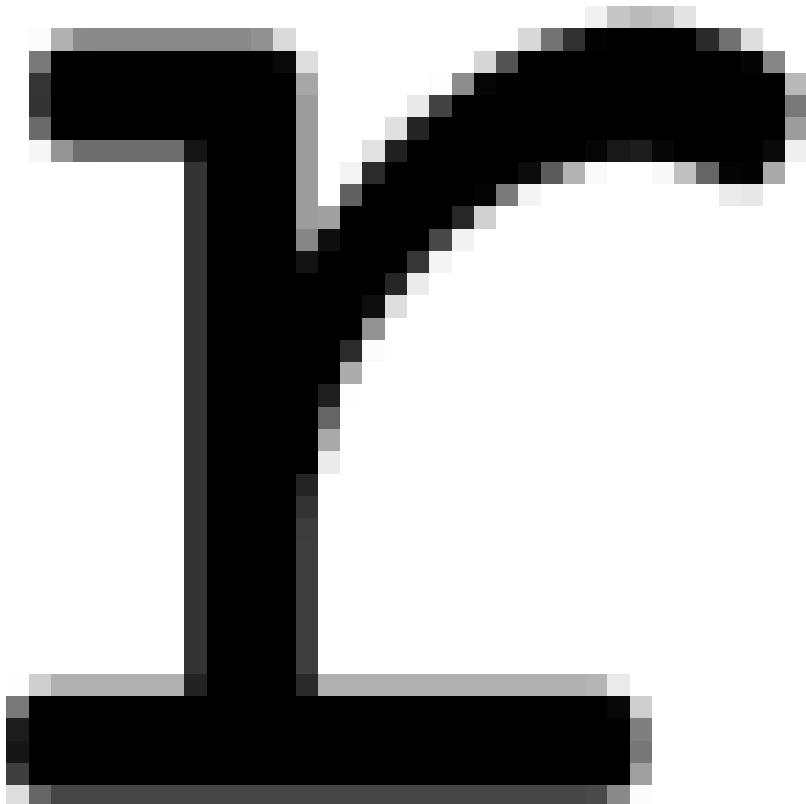












**Insight:** Updating the beliefs imply updating the semantics weights  $w_i$ , which in hand are updated using the previous slide!

Thm 3.

---

measurements (measurements)

the prediction parameters for the prediction

measures against pollution

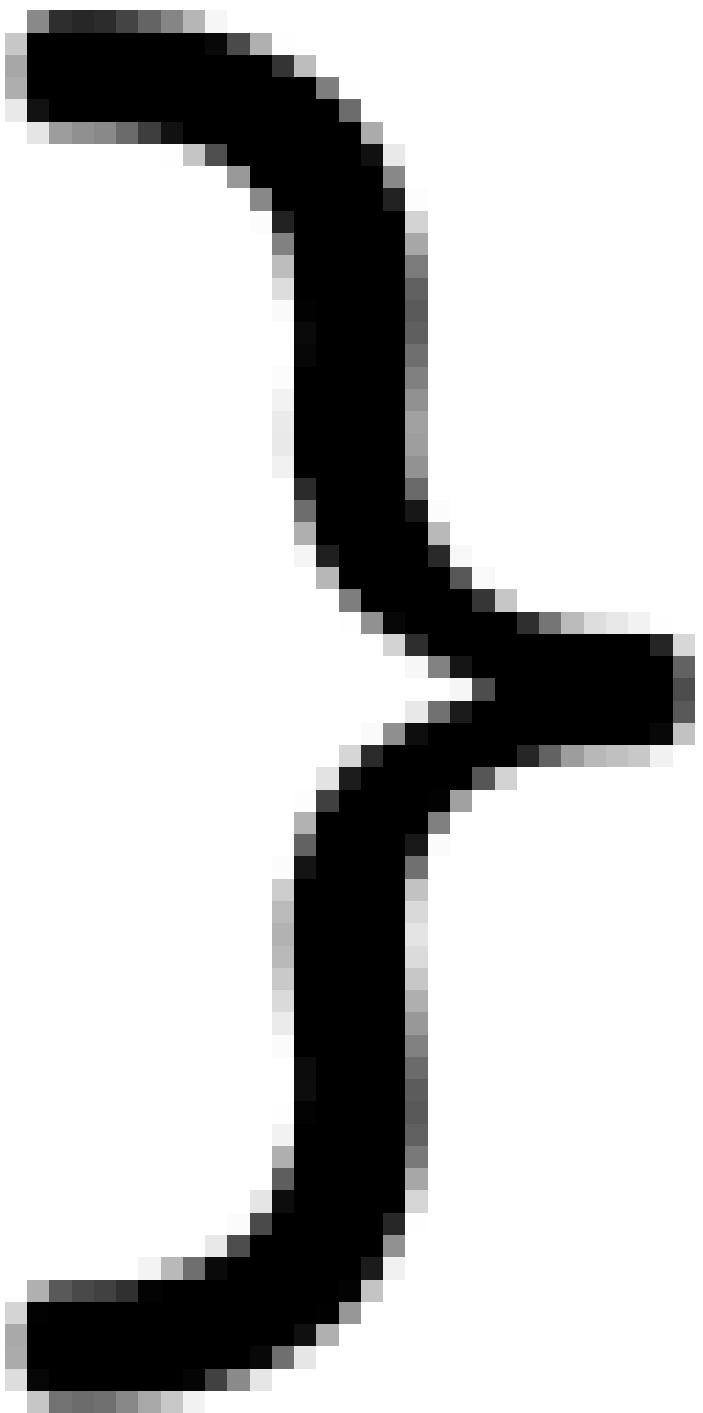
posterior

the following table. The first column lists the names of the countries, the second column lists the names of the cities, and the third column lists the names of the mountains.

$M_g(\theta)$  (posterior moments) =  $E[g(\theta)]$

missions moments

p( $\theta$ )  $\propto$   $\text{posterior}(\theta)$   $\propto$   $\text{prior}(\theta) \cdot p(\text{data} | \theta)$



$\text{gaussian}(\mu | \text{prior}_{\text{mean}})$   $\text{gaussian}(\sigma | \text{prior}_{\text{std}}$

reducir la operación a posiciones de estacionamiento

# Physical conjugate(?) prior

## DIRICHLET NORMAL-INVERSE-GAMMA

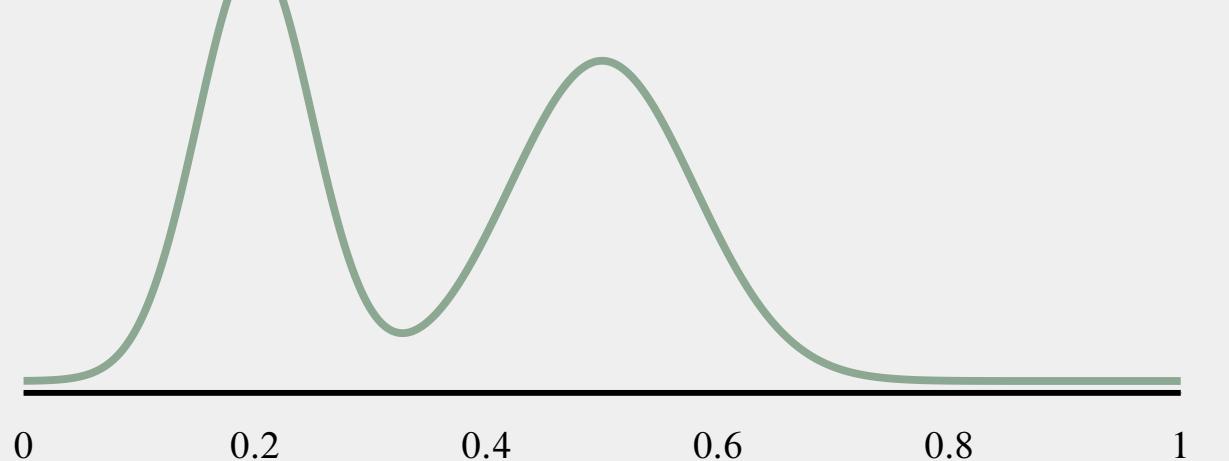
$$p(\Theta | \Psi) = \text{Dir}(\mathbf{w} | \mathbf{a}) \cdot \prod_{i=1}^k \mathcal{N}\Gamma^{-1}(\mu_i, \sigma_i^2 | \tau_i, \kappa_i, \beta_i, \gamma_i)$$

$\mathcal{N}\Gamma^{-1}$  is a conjugate prior for  $\mathcal{N}$  with unknown mean and variance.

## GAUSSIAN MIXTURE

$$p(\psi | \Theta) = \sum_{i=1}^k w_i \mathcal{N}(\psi | \mu_i, \sigma_i^2)$$

×



=

## POSTERIOR (???)

$$p(\Theta | \psi, \Psi) = \frac{1}{M} \left[ \sum_{j=1}^k c_j \text{Dir}(\mathbf{w} | \tilde{\gamma}_j) \cdot \mathcal{N}\Gamma^{-1}(\mu_j, \sigma_j^2 | \tilde{\tau}_j, \tilde{\kappa}_j, \tilde{\beta}_j, \tilde{\gamma}_j) \cdot \prod_{i \neq j}^k \mathcal{N}\Gamma^{-1}(\mu_i, \sigma_i^2 | \tau_i, \kappa_i, \beta_i, \gamma_i) \right]$$

## Thm 3.

```
funct moments(measurements) {
    Array moments_hist = [] \\ Parameters for the predictive post.
    for ψ in measurements do {
        posterior = p(θ|ψ, Ψ)
        \\ Calculate sufficient moments of the posterior
        Array moments = E[g_j(θ)] = M_{g_j(θ)}(posterior)
        moments_hist.push(moments)
        approx_post = p(moments|θ) \\ Approximate posterior as DNIG
    }
    predictive_posterior = p(ψ| E[moments_hist]) \\ Gaussian mixture
    return approx_post, predictive_posterior
}
```

Insight: Updating the beliefs imply updating the semantics weights  $w_i$ , which in hand are updated using the previous slide!

# *The Big Picture*