Algorithm S1 Particle filtering algorithm for real-time inference in meta-changing environments.

initialize N particles $P := p_1, \ldots, p_N$ from prior
each $p_i = \{s_i, \mathbf{S}_i, \mathbf{C}_i\}$, where s_i is switch state value, $\mathbf{S}_i$ switch transition matrix, $\mathbf{C}_i$ nutrient transition array
initialize particle weights $W := w_1, \ldots, w_N$ uniformly, $w_i := \frac{1}{N}$
while next nutrient C_t **do**
    for each particle p_i **do**
        weigh particle by likelihood of observed nutrient, $w_i := P(C_t \mid C_{t-1}, S_t = s_i, \mathbf{S}_i, \mathbf{C}_i)$
        update nutrient transition array $\mathbf{C}_i$
    resample particles by weights, $P := \textsc{Resample}(P, W)$
    reset weights, $w_i := \frac{1}{N}$
    for each particle p_i **do**
        sample new particle state for $t+1$, $p_i := P(S_{t+1} \mid S_t, \mathbf{S}_i)$
        update particle switch transition matrix $\mathbf{S}_i$