Amblyopia is a common developmental disorder of the visual system, which leads to decreased visual acuity in the amblyopic eye and impaired stereo vision. A key mechanism in amblyopia is the suppression of signals from the amblyopic eye. How this suppression develops is not fully understood. However, recent years have seen substantial progress in theoretical accounts of the healthy development of binocular vision in the context of the Active Efficient Coding (AEC) framework. AEC is a generalization of classic efficient coding theories to active perception. It describes the simultaneous learning of receptive fields and movements of the sense organs to jointly maximize sensory coding efficiency. Along these lines, computational models for the healthy development of active binocular vision and active motion vision have been proposed (1, 2). Here we investigate whether AEC can also account for the development of amblyopia in the case where the two eyes have different refractive powers.

**Methods.** We extend a previous model for the learning of active binocular vision in two directions. First, in addition to vergence eye movements the model also learns to control accommodation of the lenses to focus on near and far objects. Second, we add a suppression mechanism which allows the attenuation of signals from one eye by neurons whose sensitivity is biased towards the other eye. The model learns to control vergence and accommodation in an environment where planar objects are presented at different depths. The control can be thought of as the shifting of three different planes (Fig. 1a) relative to the plane where an object is presented. The distance between the object plane and the vergence plane determines the disparity between left and right eye. The distance between object plane and the two accommodation planes determines how sharp or blurry the input to the two eyes is (Fig. 1b). The input is whitened and encoded by sparse coding models at two scales (coarse and fine) sensitive to different spatial frequencies. For this we employ the matching pursuit algorithm (3) (Fig. 2, right). Vergence and accommodation commands are learned by two natural actor-critic reinforcement learners (4) to maximize the overall coding efficiency (Fig. 2, left). We include within-scale interocular suppression by introducing a mechanism where strong responses from monocular neurons suppress input signals from the other eye.

**Results.** In the healthy condition without anisometropia, the model learns to accommodate correctly and to perform precise vergence eye movements. Most neurons develop binocular receptive fields.