A. Overview

Physarum is a particle system that models organic growth. Simulated patterns closely resemble those that are found in nature. Slightest change in simulation parameters create completely new results. Physarum can interact with other layers, including graphics, animations and live footage. Physarum gives you a lot of possibilities for experiments and exploration. Find your own Physarum!

Physarum Manual
Adobe After Effects Plugin

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B. Description

Plugin creates a transport network that simulates the growth structure of slime mold physarum polycephalum. Particles (number of particles is determined by *Particle Count*[8] parameter) are spawned inside *Spawn Layer*[2]. Then they choose their movement direction using sensors, which are defined by *Sensor Angle*[3] and *Sensor Distance*[5]. *Sensor angle*[3] determines a particle's field of vision when the particle is choosing a possible direction; smaller numbers mean sharper angles. *Sensor Distance*[5] sets distance a particle analyzes before choosing a direction. Moving particles leave a trail behind, brightness of which is measured by *Trail Color*[7]. Particles will use existing trails to choose direction and will prioritise brighter trails. Upon determining a new direction every particle will turn towards it by a number of degrees specified by *Turn Angle*[4]. It will make a 'step' in that direction, creating a trail that will fade by a value of *Decay*[6]. Higher decay means faster fading.

C. Parameters Overview

1. *Random Seed.* Seed used to initialize a random number generator. Same values are used to get identical results.

2. *Spawn Layer*. Sets a spawn area for particles. Layer area must be opaque, non-black (not #000000) and inside a frame, otherwise particles will be generated evenly across a frame.

3. *Sensor Angle.* Defines angle between middle and side sensors. (Sensors create 2 corners with vertex on the particle position)

4. *Turn Angle*. Defines particle turn angle in chosen direction.

5. *Sensor Distance*. Determines distance between particle and its sensor (in pixels).

6. *Decay*. Defines how long a particle trail takes it to fade out. Smaller numbers means slower fade.

7. *Trail Color.* Trail brightness at birth.

8. *Particle Count in %*. Particle amount in relation to frame size in %. For example a 820 × 820 frame has 672400 pixels in total. Particle Count of 15% will spawn 100860 particles. This parameter can be animated. If more particles are added Spawn Layer will be used (or whole frame if none is selected). If the amount of particles is reduced, 'younger' particles are removed.

9. *Infection*. Turns 'infection mode' On and Off. Infection is used to gradually change starting parameters. To use infection an Infected Layer has to be chosen, where non-black, opaque area designates infection origin. In this area particles inherit 'infected' properties (that are set in the drop down 'Infection' menu) and leave infected trails that turn any colliding particle into infected ones.

D. Interactions with composition layers

A Physarum layer and other layers in a comp can interact. We strongly suggest applying Physarum to an Adjustment Layer. Every layer underneath said Adjustment Layer will be incorporated into Physarum simulation. For example:

1. Any non black colors will spawn virtual trails that will not appear in the final render but will influence existing particles (Brighter colors will generate more virtual trail). Therefore, white areas will attract particles.

2. Black areas delete existing trails; particles will regard those areas as empty and will not leave any trail there.