

A vibrant, multi-colored nebula (purple, pink, orange, yellow, green) with a large, smiling face. Inside the nebula is a smaller, yellow, smiling star-like object with two small blue eyes. The background is black with many small, white and yellow stars.

*Where do baby stars come from?*

*By: Emma Mannfors*



Once upon a time there was a space cloud who lived all alone,  
far away from the Milky Way's spiral arms

Science note: Dense clouds can have temperatures of -260 C



It was very cold

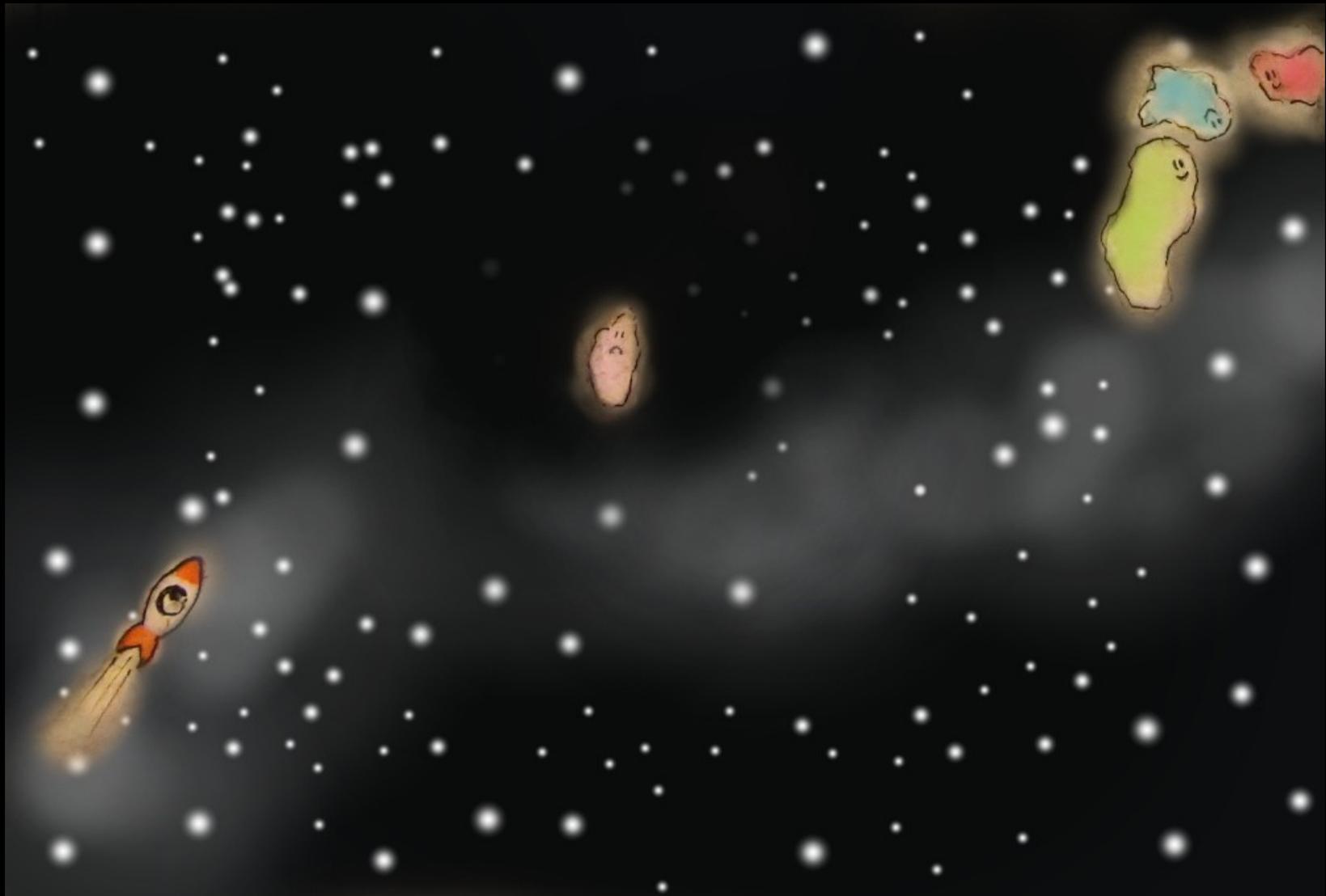
Science note:

Average density of a dense cloud  $\sim 10^6 \text{ cm}^{-3}$

Earth's atmosphere  $\sim 7 \times 10^{26} \text{ cm}^{-3}$



The cloud didn't even have a lot of atoms inside them to keep them company!  
The cloud was very lonely



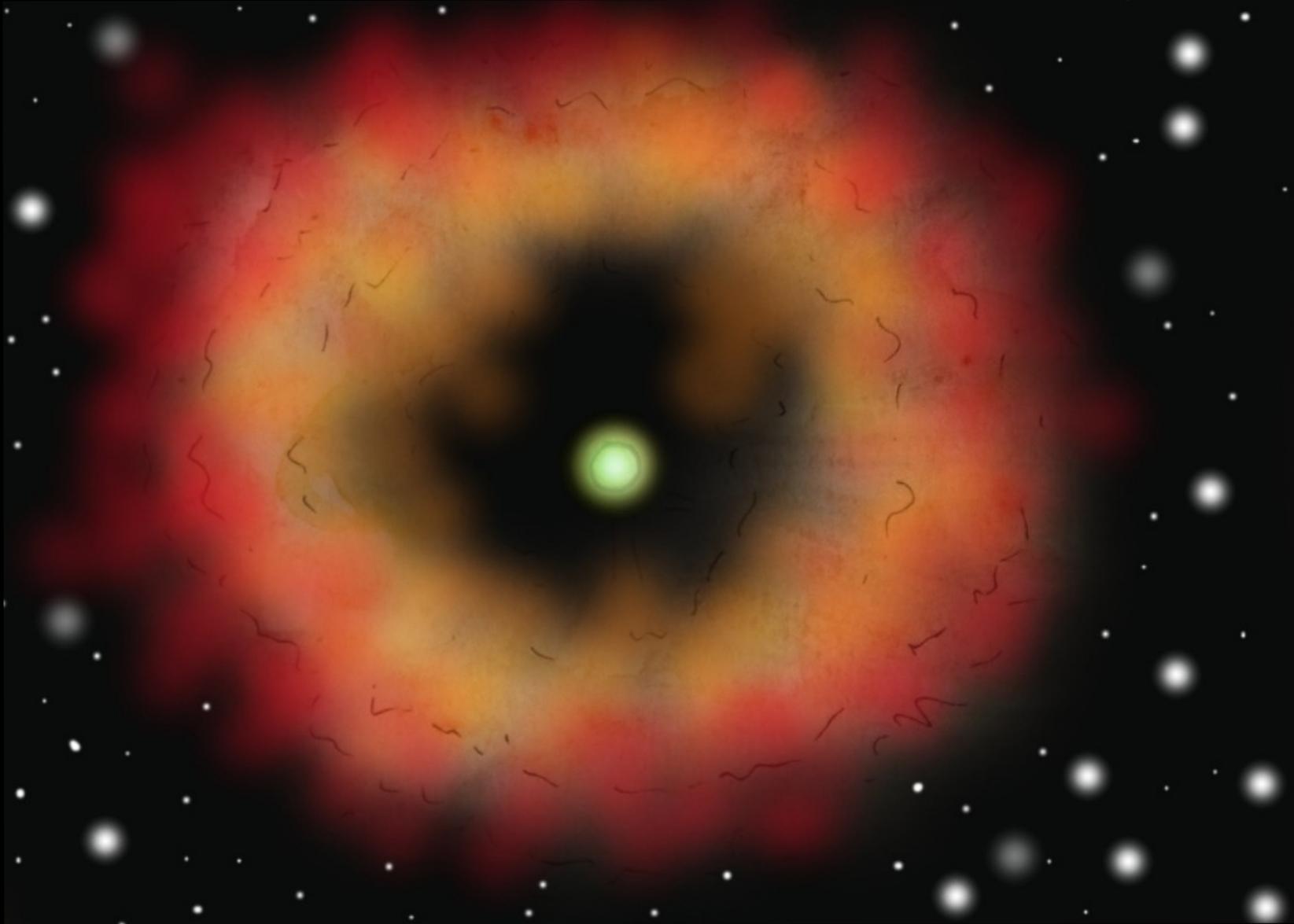
“I wish I had friends” the cloud thought

But what they didn't know was that 50 parsecs away, something was happening....

Science note:  
O stars are the biggest and hottest stars.  
They live for around 1 million years and  
explode in a supernova



A huge O star had just stopped nuclear fusion!  
The star began to collapse under gravity....

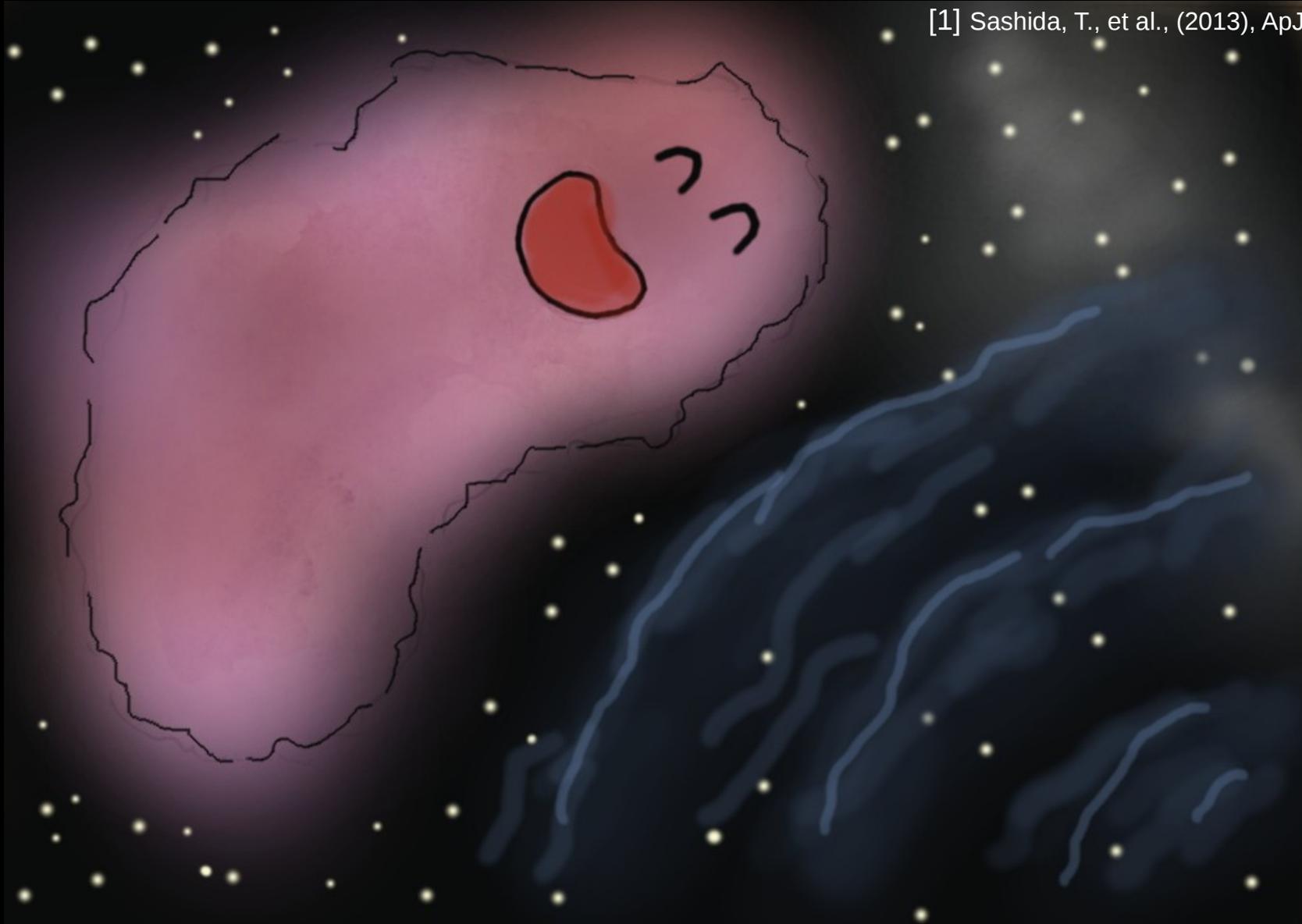


In just a few moments, the star's core collapsed into a tiny object,  
until suddenly...



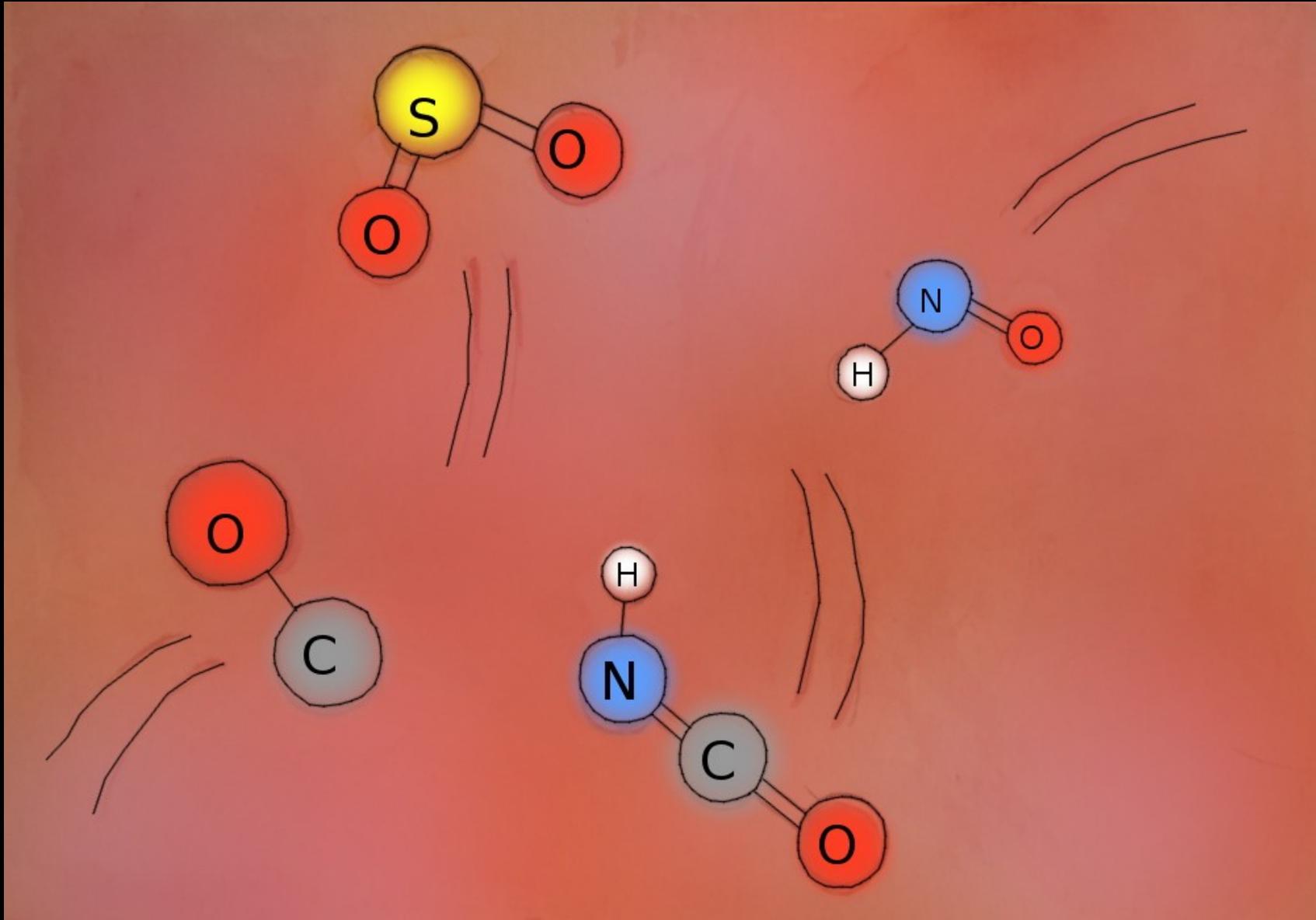
IT EXPLODED!

Science note:  
Velocity of supernova shocks:  $\sim 13$  km/s [1]  
Time taken to reach cloud  $\Delta t \sim 4 \times 10^6$  years  
[1] Sashida, T., et al., (2013), ApJ, 774, 10.



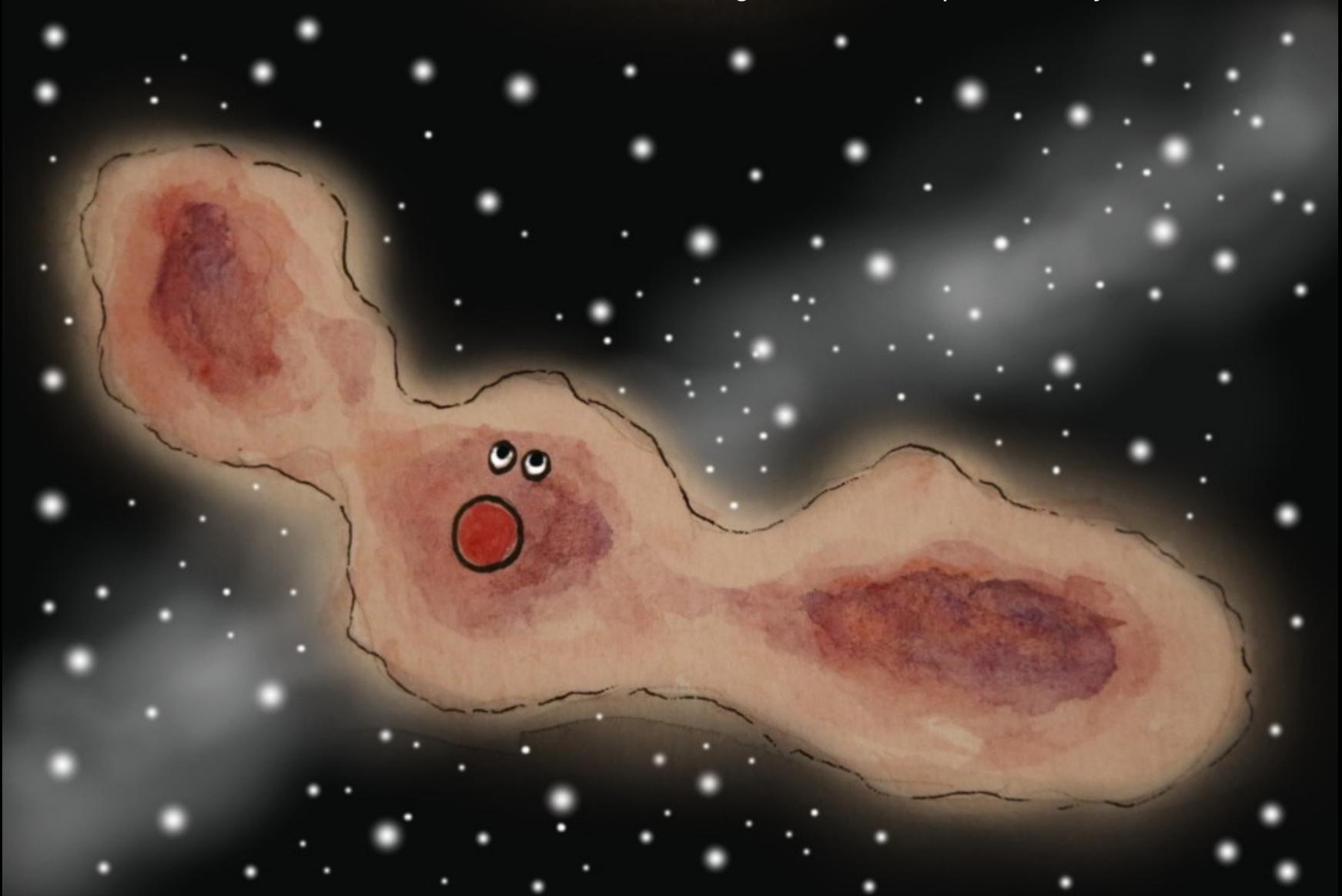
The shock wave traveled through space,  
and many years later began to tickle the cloud!

Science note:  
Hundreds of molecules have been found inside cold,  
dense space clouds

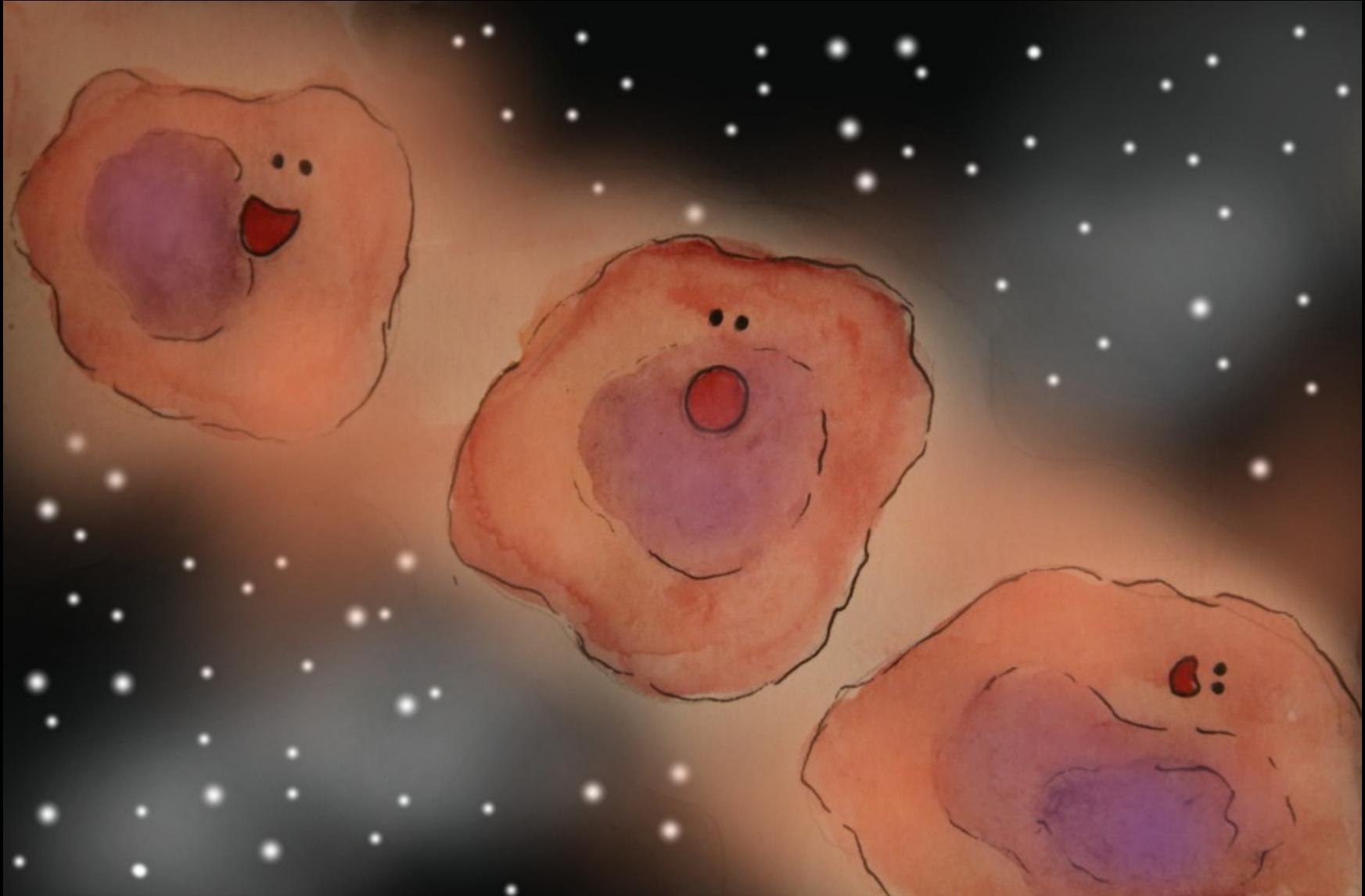


The molecules inside the cloud began to bounce around and bump into each other!

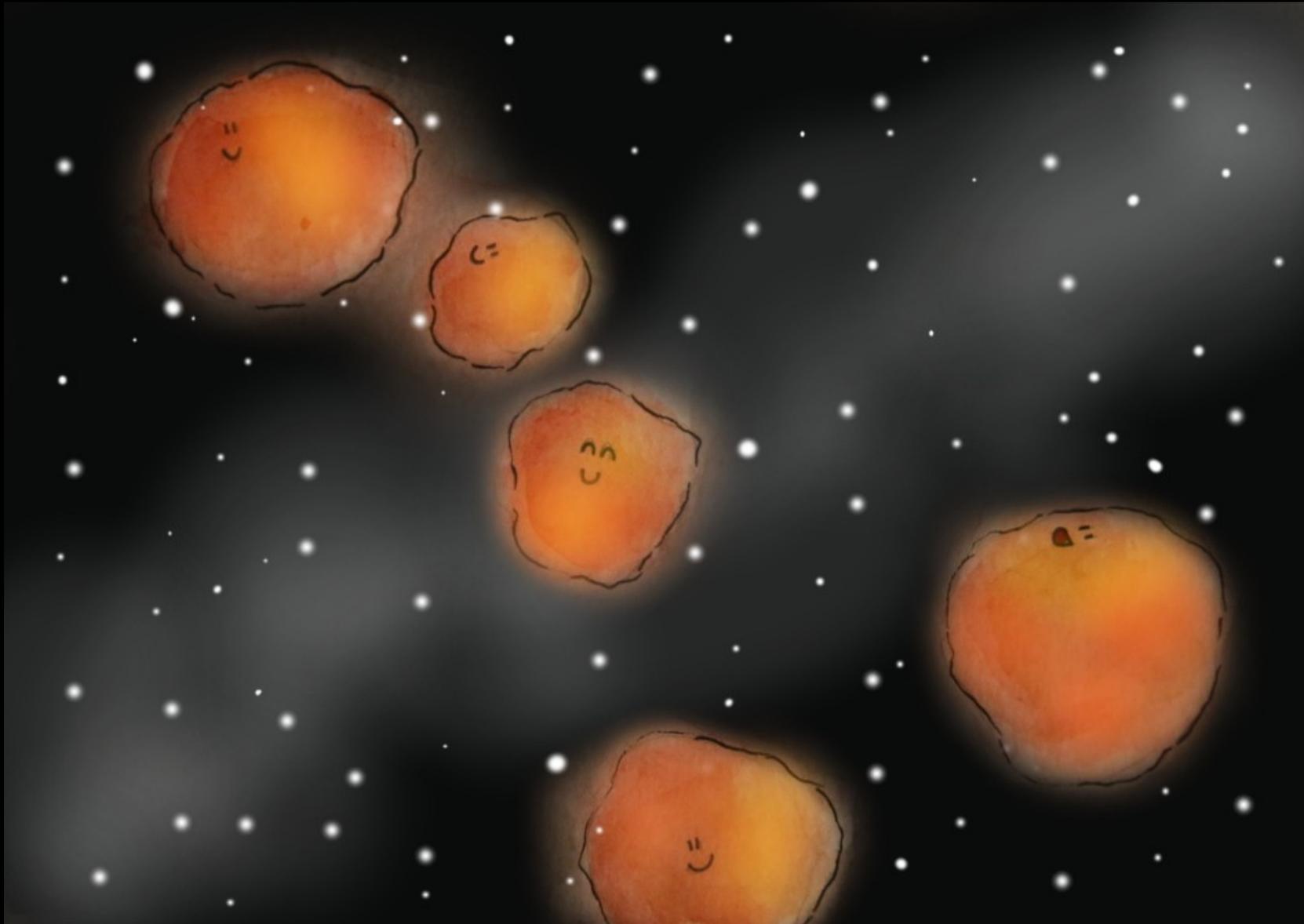
Science note:  
Supernovae are not the only things that can cause star-forming clouds to collapse, but they are the most fun to draw



The cloud began to change shape!



They started to split up into many smaller clouds. But don't worry, this didn't hurt the cloud at all!



Many years went by, and the clouds became smaller and denser.

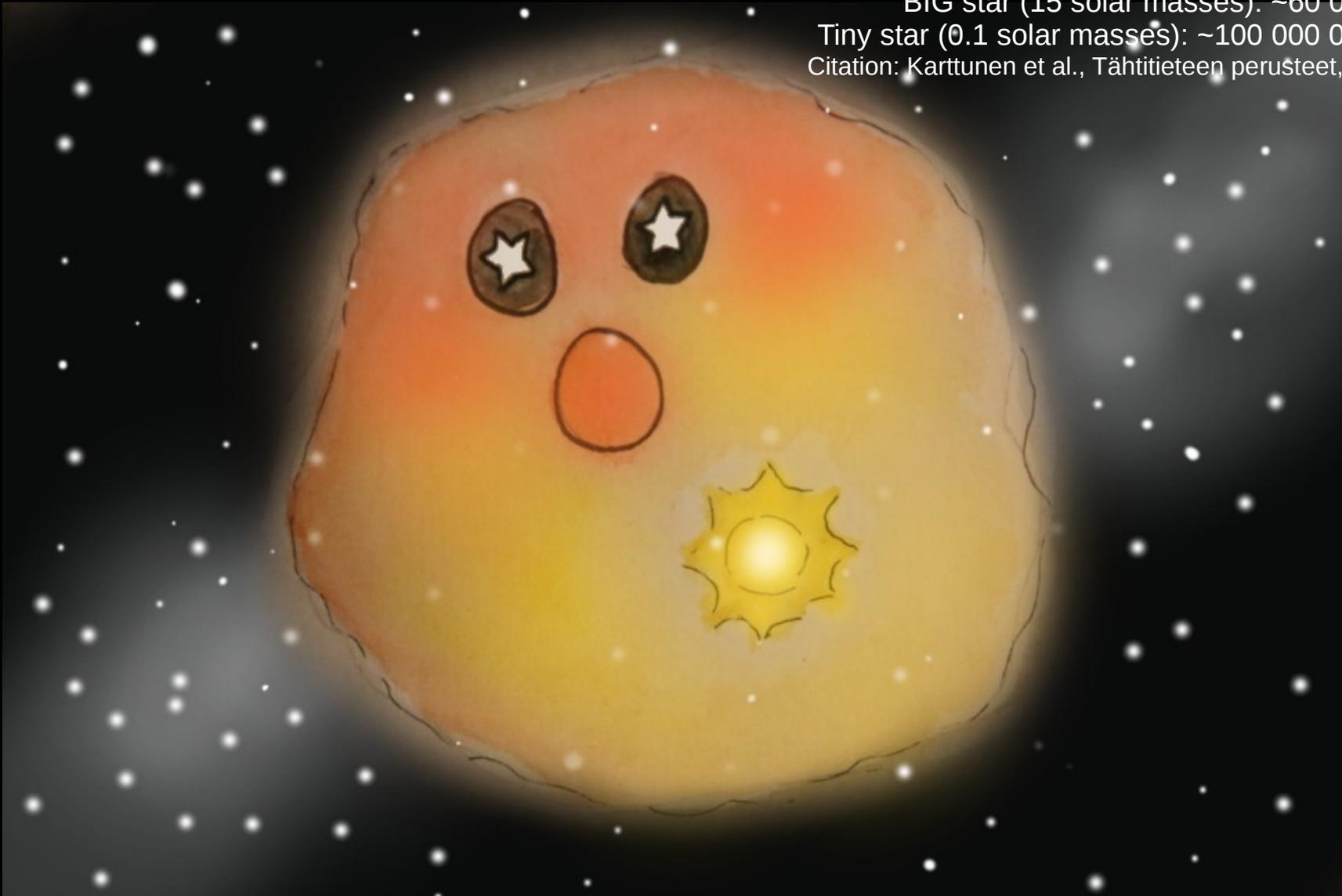
Until one day, in the center of the heaviest clump....

Science note:

Time taken for clump to collapse into a star  
BIG star (15 solar masses): ~60 000 years

Tiny star (0.1 solar masses): ~100 000 000 years

Citation: Karttunen et al., Tähtitieteen perusteet, 5<sup>th</sup> edition

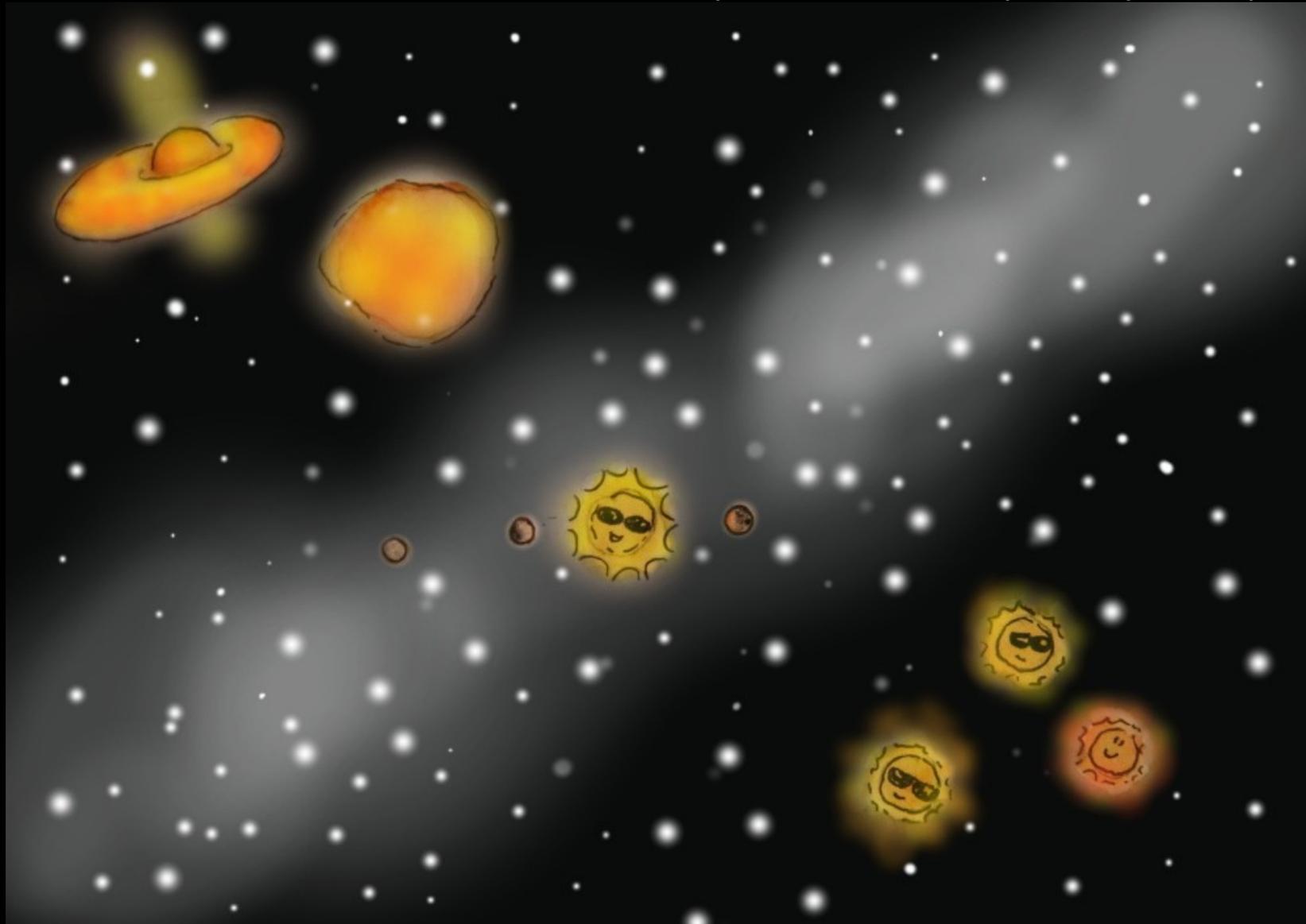


The first star was born! The cloud began to glow and get warmer

Soon, more stars started to glow inside the cloud!

Science note:

From left: protostellar disk, clump, solar system, triple star system



And soon, planets and asteroids formed around the young stars!

Finally, there was warmth and so many friends!