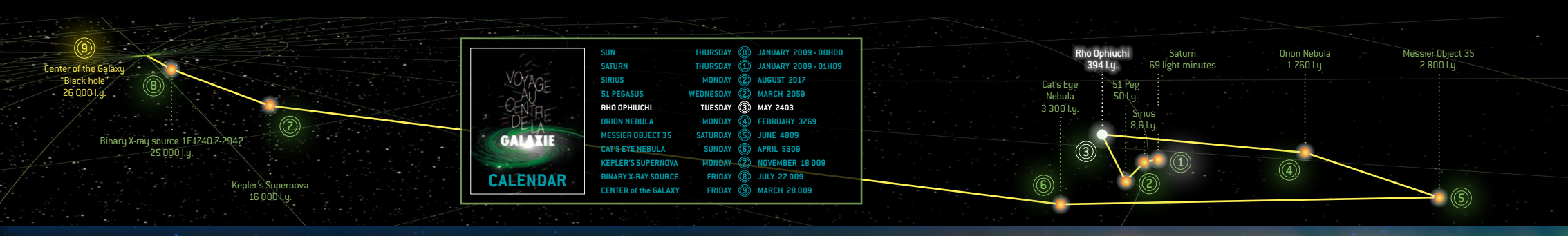


3

Rho Ophiuchi seen by the satellite Spitzer, in infra-red

The Dark Clouds that give birth to stars

DIVING INTO THE HEART OF DARK CLOUDS – THE FIRST STAGES OF THE FORMATION OF STARS ARE VISIBLE THANKS TO MICRO-WAVE RADIATION

Zoom

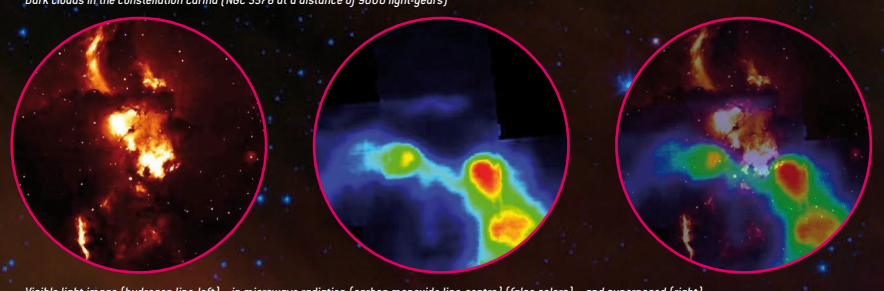
When a dark cloud collapses, it concentrates matter. The density increases, as does the temperature, reaching up to 15 million degrees. It is then that nuclear fusion reactions are triggered, transforming hydrogen into helium. These reactions produce the enormous quantity of energy that makes stars shine in a lasting way. ***Rho Ophiuchi*** is one of the Galaxy's dark clouds, in the ***constellation Ophiuchus***, next to ***Orion***, at a distance of 407 light-years from the Sun. The average age of the stars in this cloud is 300,000 years – very young stars.

dust

At the beginning, everything is just **dust and gases.**

Huge **clouds** form with these constituents that are the most abundantly found in the Galaxy. These are dark and freezing clouds, undetectable in visible light. They can be only seen through the **microwave radiation** they emit.

Dark clouds in the constellation Carina (NGC 3576 at a distance of 9000 light-years)

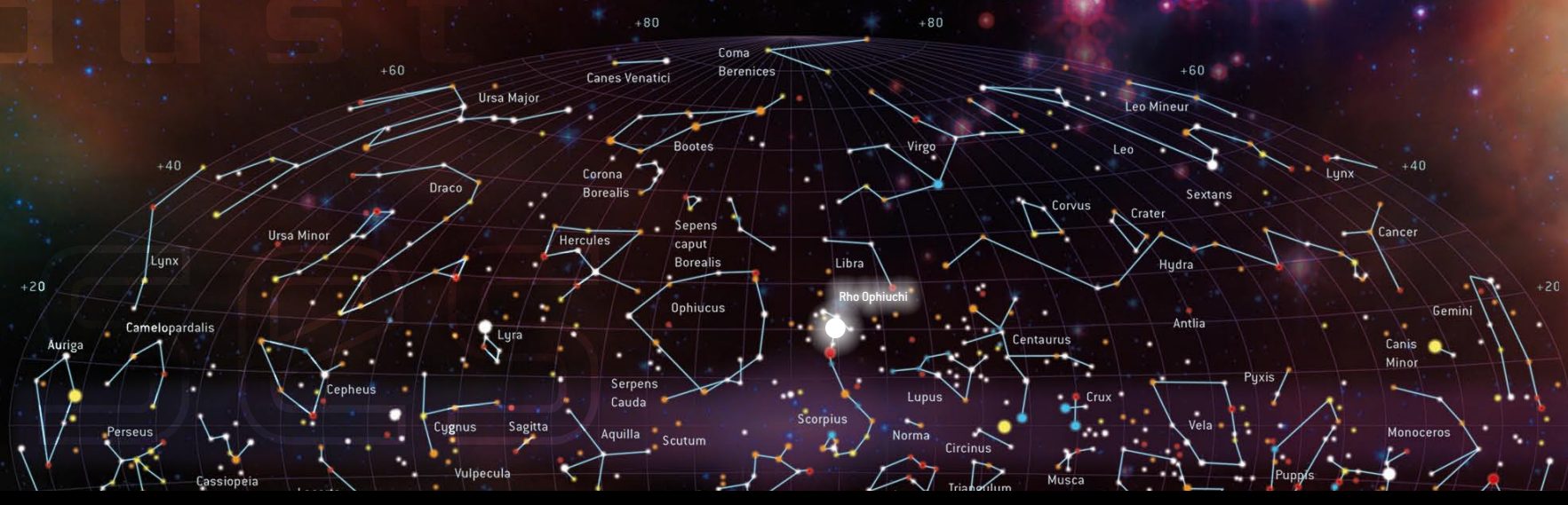


Visible light image (hydrogen line-left)... in microwave radiation (carbon monoxide line-centre) (false colors)... and superposed (right). Microwave radiation stems from the most opaque parts of the visible light image

instability

In some areas, a star passing by or some movement in the Galaxy, sometimes creates an **instability** that compresses a cloud. The cloud collapses and lumps of gas are created, increasing in density, with the biggest absorbing the smallest. Within this concentrated matter, the **temperature** increases until it triggers the **ignition** of a star. The cosmic cauldron then does its work and **a star is born.**

gases



cea

THE UNIVERSE YOURS TO DISCOVER
INTERNATIONAL YEAR OF ASTRONOMY 2009

Liberté • Égalité • Fraternité
RÉPUBLIQUE FRANÇAISE
MINISTÈRE DES AFFAIRES ÉTRANGÈRES ET EUROPÉENNES

cnes