A 4-m UV/optical telescope + external occulter will be the most powerful life-finder telescope, because

(1) it is sensitive to low amounts of O₂

*Left:* Spectra of the Earth by GOME show that O₃ absorption band is saturated at λ<300 nm

*Right:* the O₃ band is expected to be saturated down to O₂=0.21%!
(2) Because $O_3$ can be detected by filter photometry
(3) Because cyanobacteria created $O_2$ on the early Earth (1 Gyr)

Photosynthesizing marine organisms last 3.5 Gyr

Chisholm estimates that Prochlorococcus is responsible for about 5 to 10% of the photosynthesis on Earth today. She traces its origins back 3.5 billion years to cells with mutations that resulted in the release of oxygen into the atmosphere.

“They split water, which is H2O, and that oxygen was released into the atmosphere…” she said. “So if these cells hadn’t discovered, so to speak, photosynthesis, there wouldn’t be oxygen in our atmosphere, and we certainly never would have evolved.”

http://www.pbs.org/newshour/updates/tiny-ocean-organism-brought-earth-life/

Fossil Cyanobacteria
3.5 Gyr old

W. Schopf