

ASTROČESTIČNA FIZIKA

svemir iz nove perspektive

Dario Hrupec

Otvoreni dani Odjela za fiziku, Osijek
8. studenog 2022.

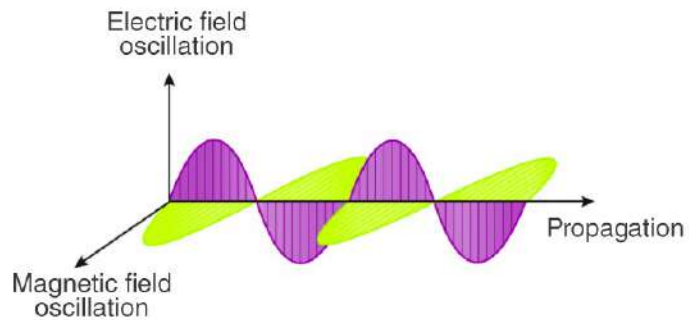
fotoni

kozmičke zrake

astrofizički neutrini

gravitacijski valovi

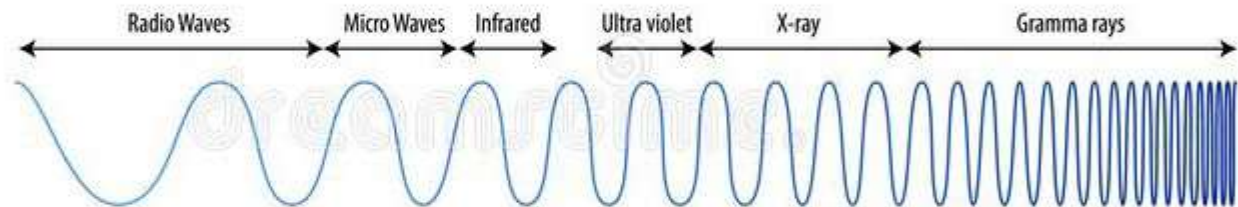
Fotoni: što su?



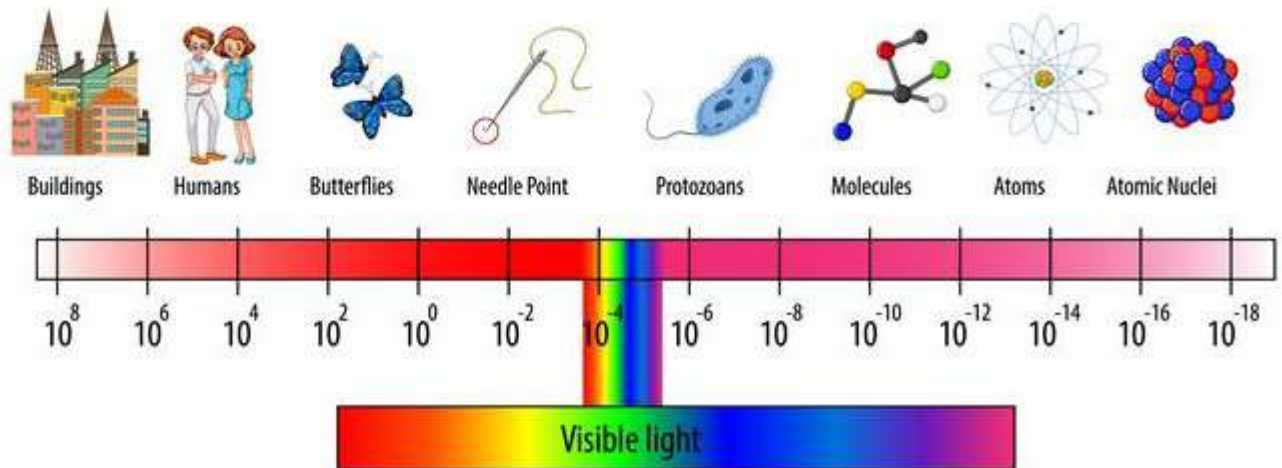
Sources



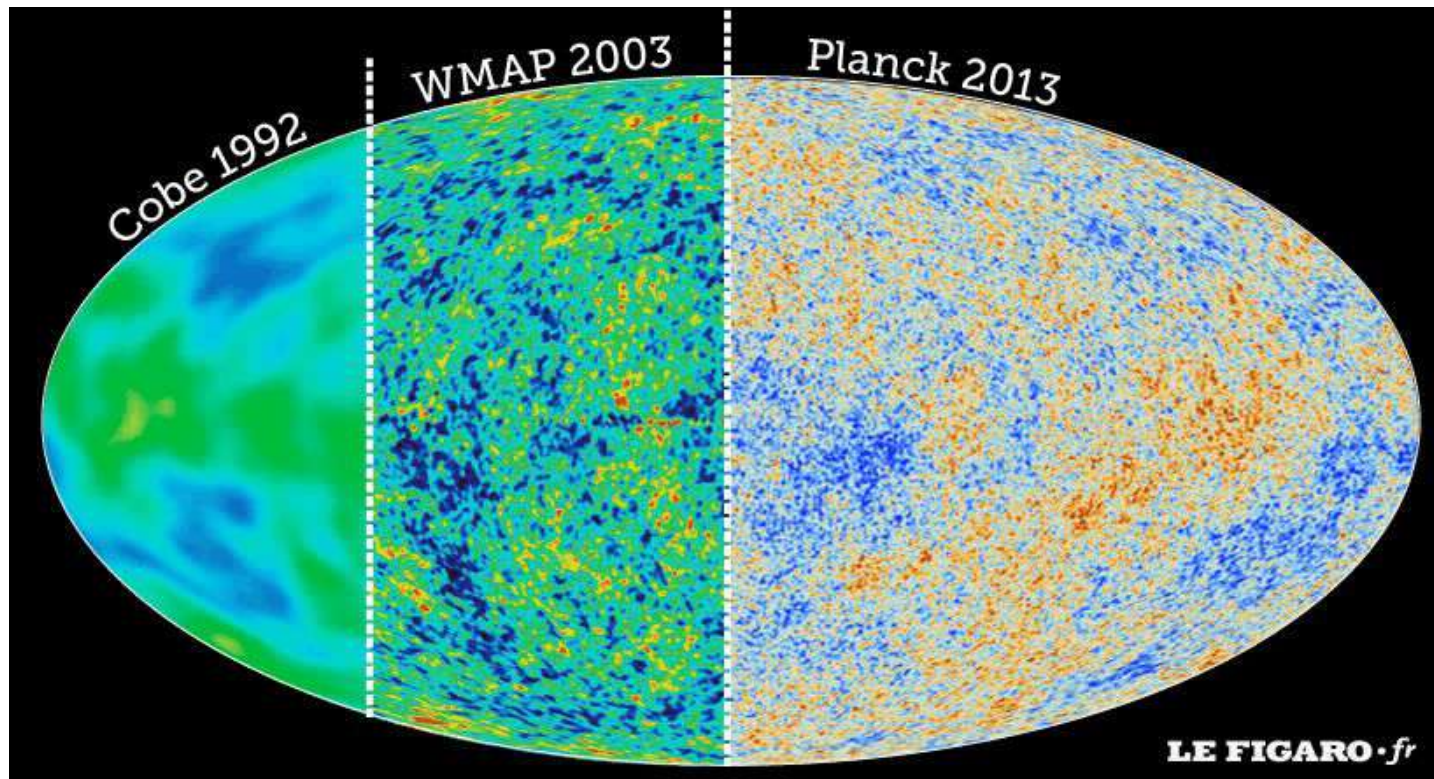
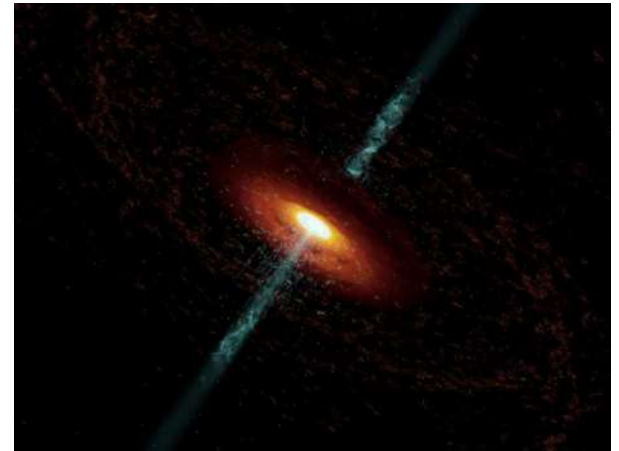
Radiation Type
Wavelength (m)



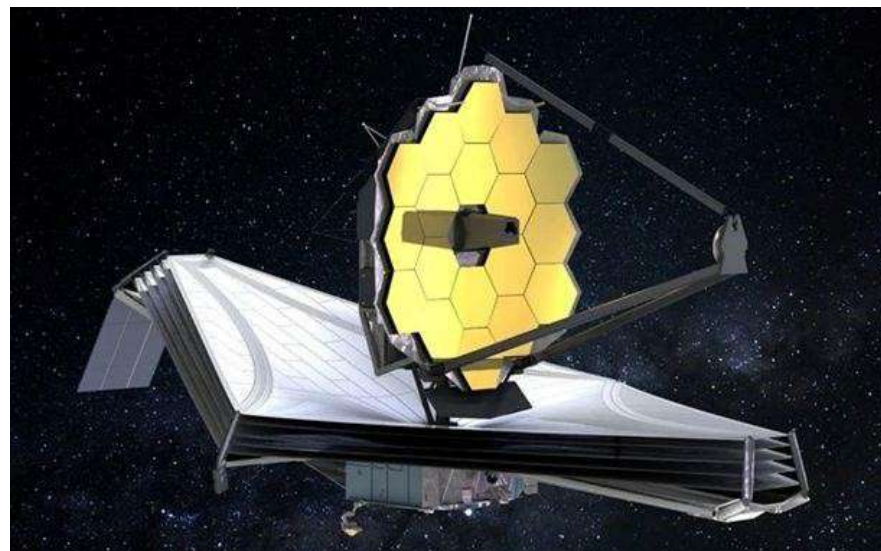
Approximate scale
of wavelength

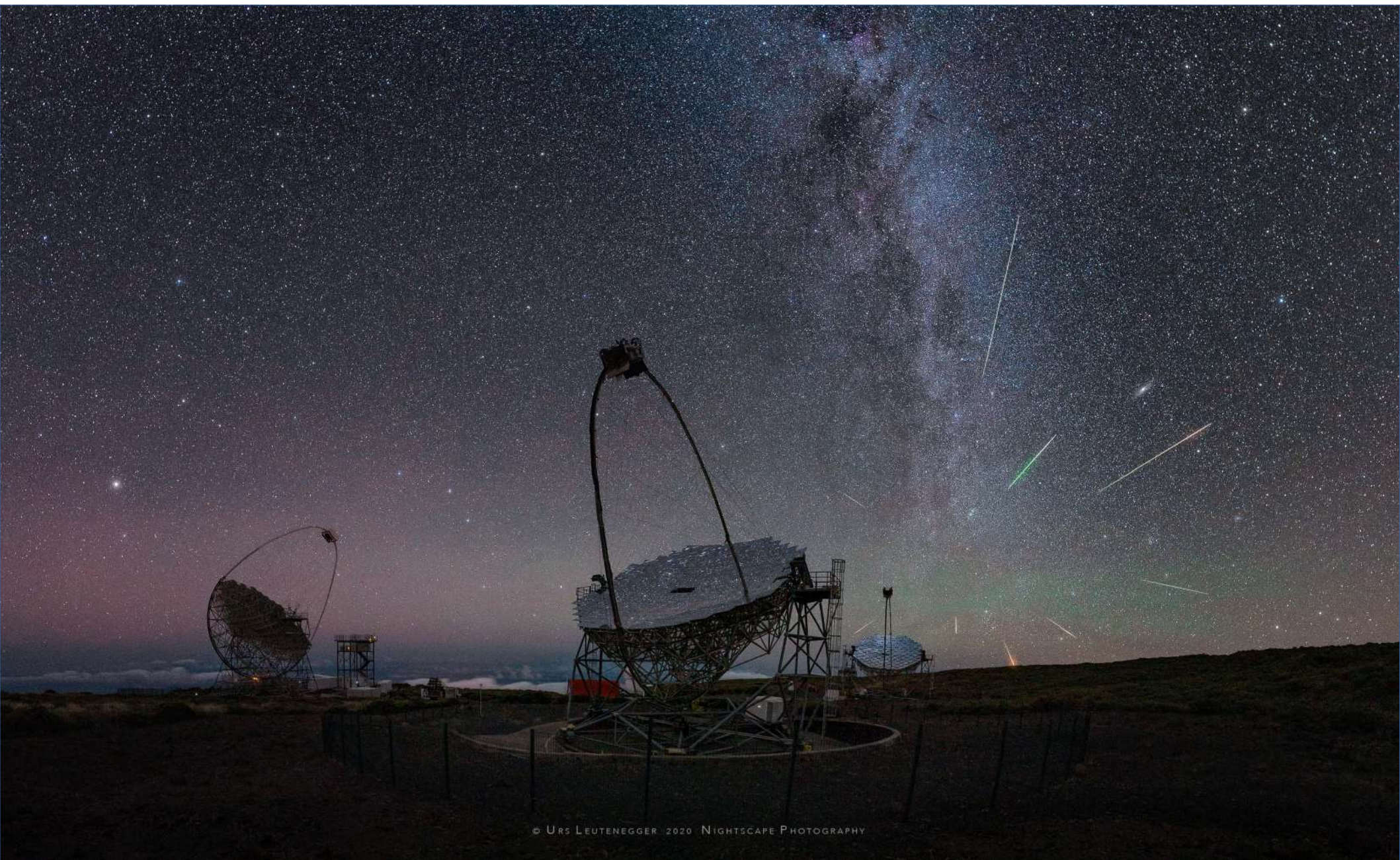


Fotoni: odakle dolaze?



Fotoni: kako ih opažamo?





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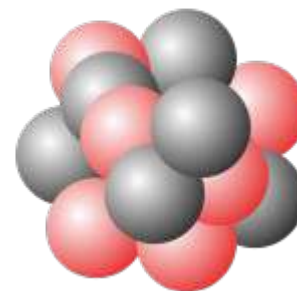
Kozmičke zrake: što su?



proton

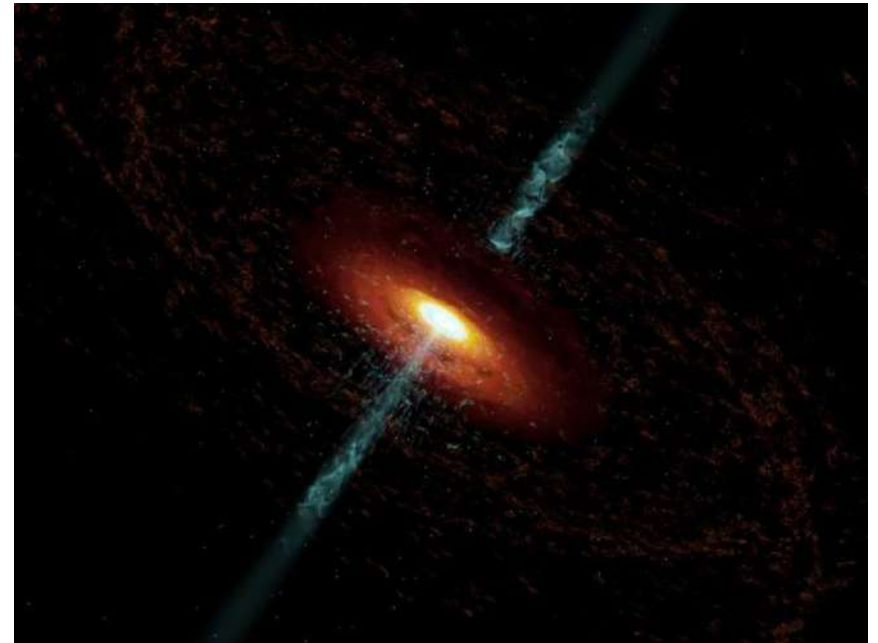
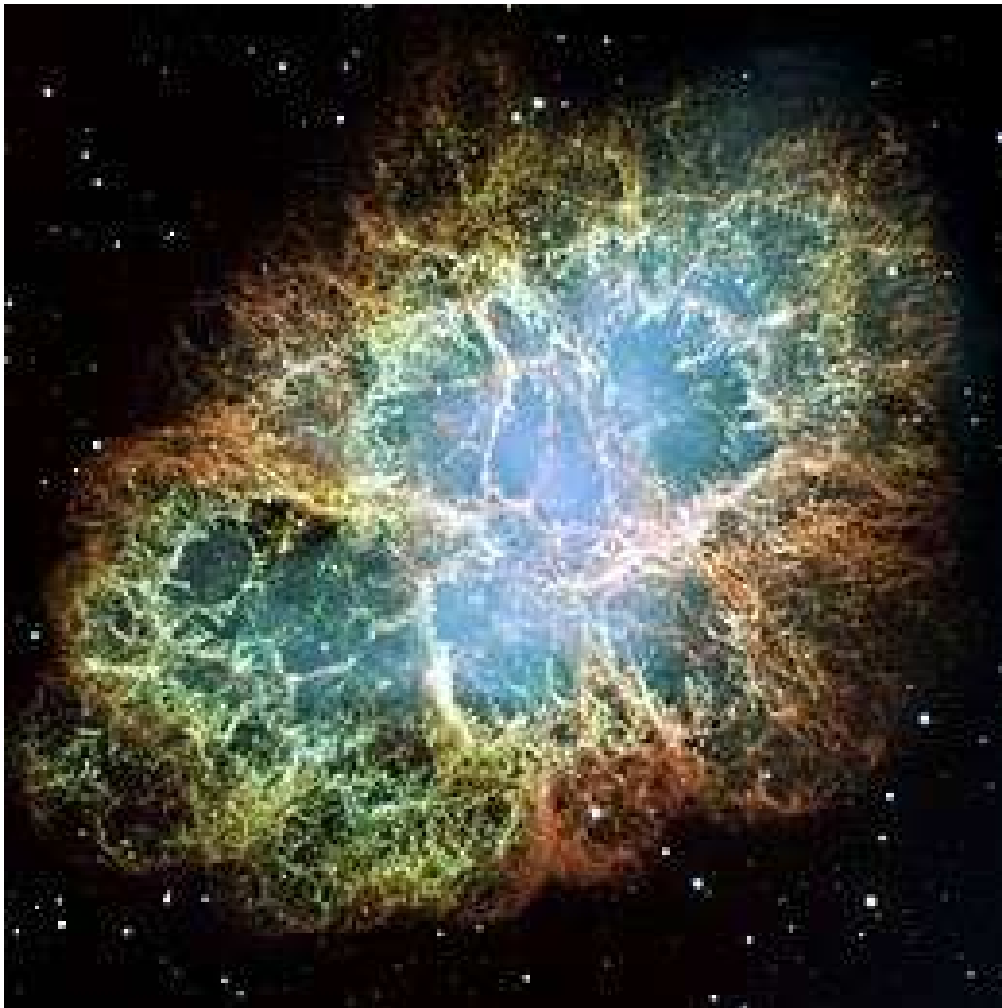


alfa-čestica

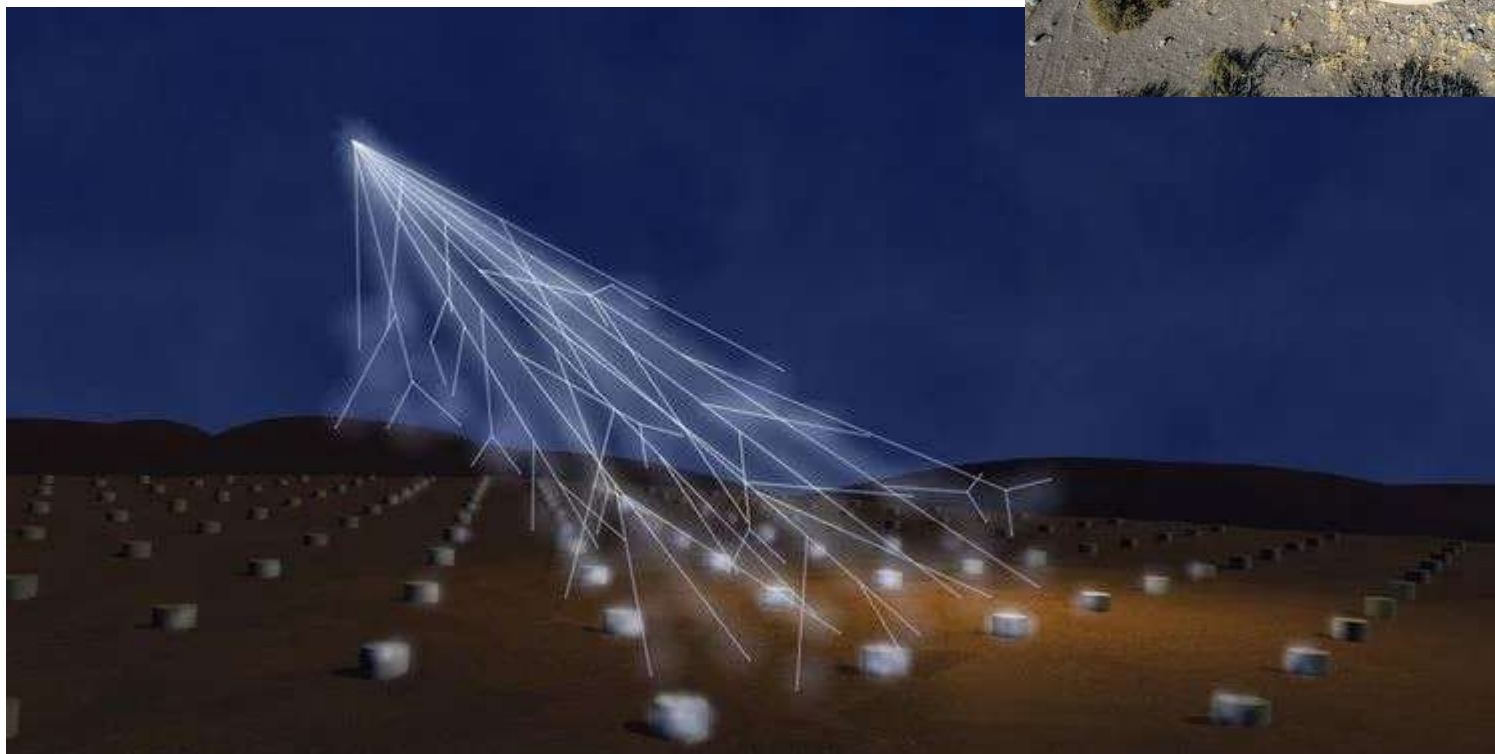


teška jezgra

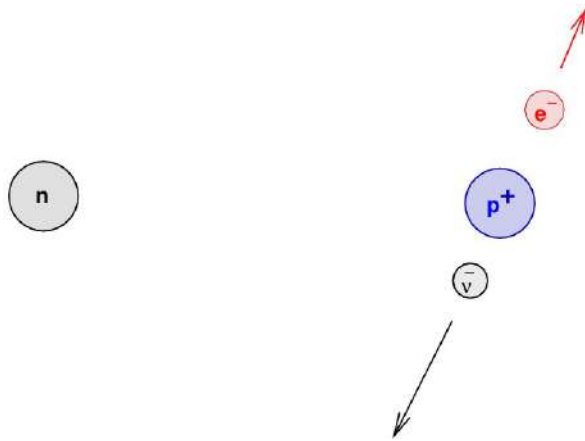
Kozmičke zrake: odakle dolaze?



Kozmičke zrake: kako ih opažamo?



Astrofizički neutrini: što su?



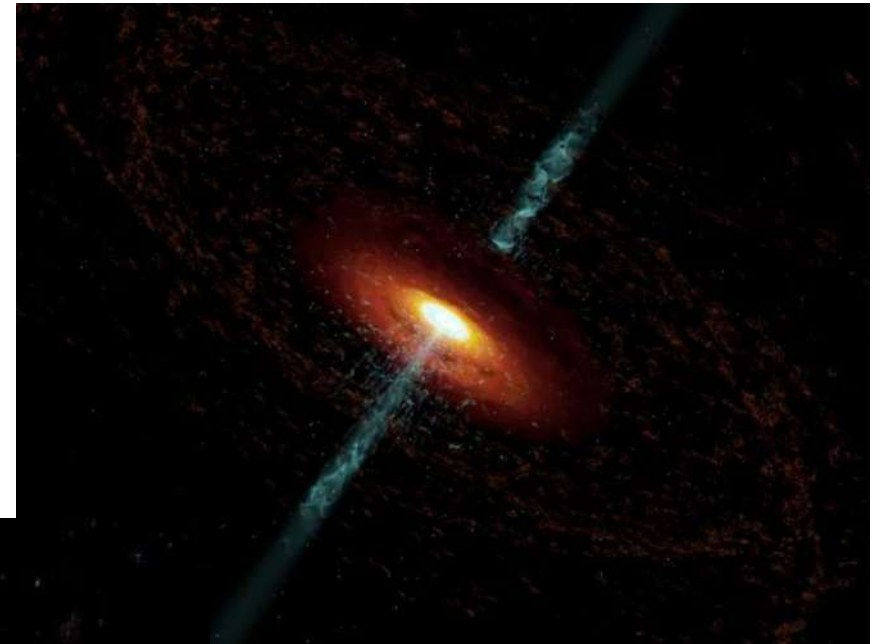
Standard Model of Elementary Particles

three generations of matter (fermions)			interactions / force carriers (bosons)	
	I	II	III	
QUARKS	mass $\approx 2.2 \text{ MeV}/c^2$ charge $\frac{2}{3}$ spin $\frac{1}{2}$ u up	mass $\approx 1.28 \text{ GeV}/c^2$ charge $\frac{2}{3}$ spin $\frac{1}{2}$ c charm	mass $\approx 173.1 \text{ GeV}/c^2$ charge $\frac{2}{3}$ spin $\frac{1}{2}$ t top	mass $\approx 124.97 \text{ GeV}/c^2$ charge 0 spin 0 H higgs
	mass $\approx 4.7 \text{ MeV}/c^2$ charge $-\frac{1}{3}$ spin $\frac{1}{2}$ d down	mass $\approx 96 \text{ MeV}/c^2$ charge $-\frac{1}{3}$ spin $\frac{1}{2}$ s strange	mass $\approx 4.18 \text{ GeV}/c^2$ charge $-\frac{1}{3}$ spin $\frac{1}{2}$ b bottom	mass 0 charge 0 spin 1 g gluon
	mass $\approx 0.511 \text{ MeV}/c^2$ charge -1 spin $\frac{1}{2}$ e electron	mass $\approx 105.66 \text{ MeV}/c^2$ charge -1 spin $\frac{1}{2}$ μ muon	mass $\approx 1.7768 \text{ GeV}/c^2$ charge -1 spin $\frac{1}{2}$ τ tau	mass $\approx 91.19 \text{ GeV}/c^2$ charge 0 spin 1 γ photon
LEPTONS	mass $< 1.0 \text{ eV}/c^2$ charge 0 spin $\frac{1}{2}$ ν_e electron neutrino	mass $< 0.17 \text{ MeV}/c^2$ charge 0 spin $\frac{1}{2}$ ν_μ muon neutrino	mass $< 18.2 \text{ MeV}/c^2$ charge 0 spin $\frac{1}{2}$ ν_τ tau neutrino	mass $\approx 80.39 \text{ GeV}/c^2$ charge ± 1 spin 1 Z Z boson
				mass $\approx 80.39 \text{ GeV}/c^2$ charge ± 1 spin 1 W W boson

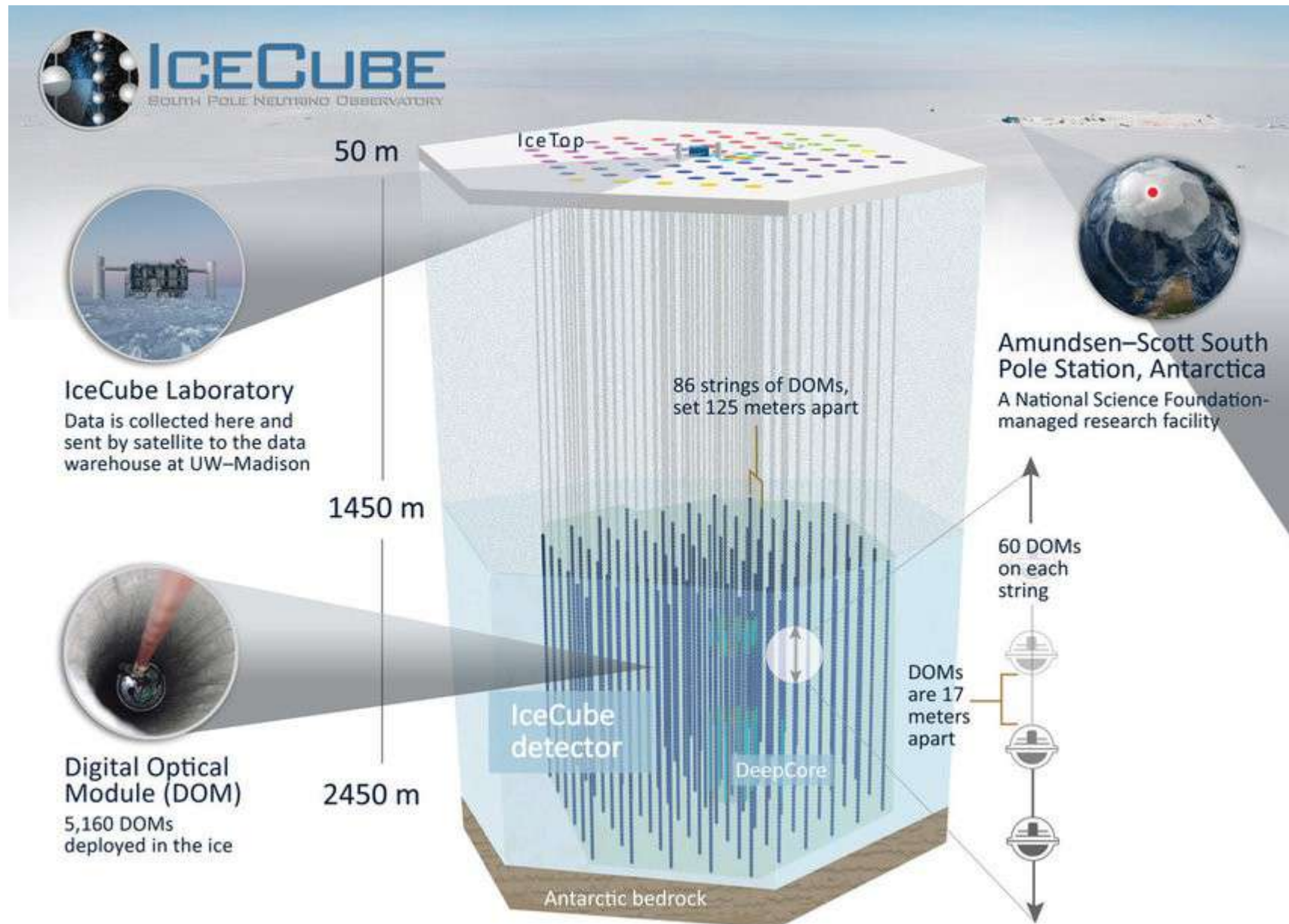
SCALAR BOSONS

GAUGE BOSONS
VECTOR BOSONS

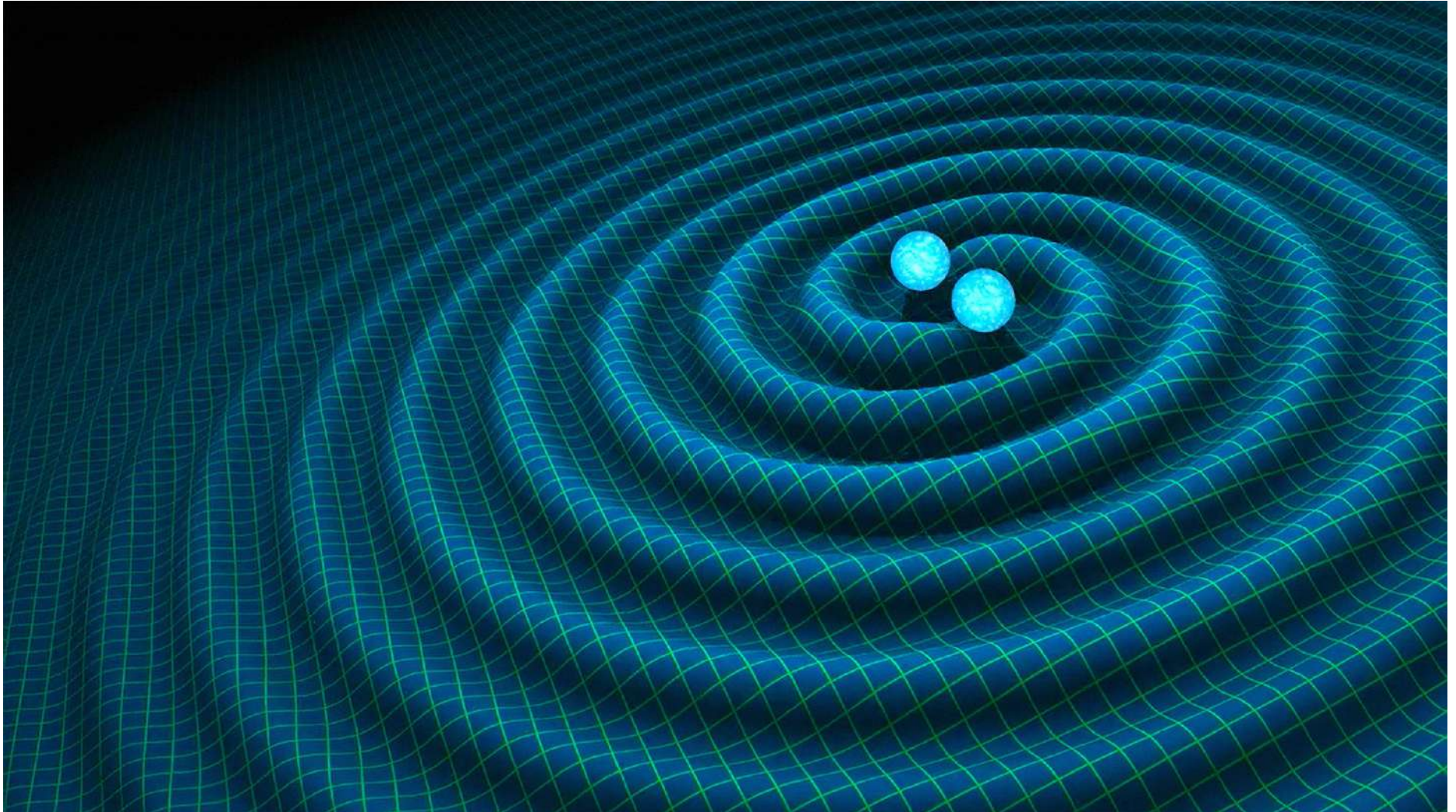
Astrofizički neutrini: odakle dolaze?



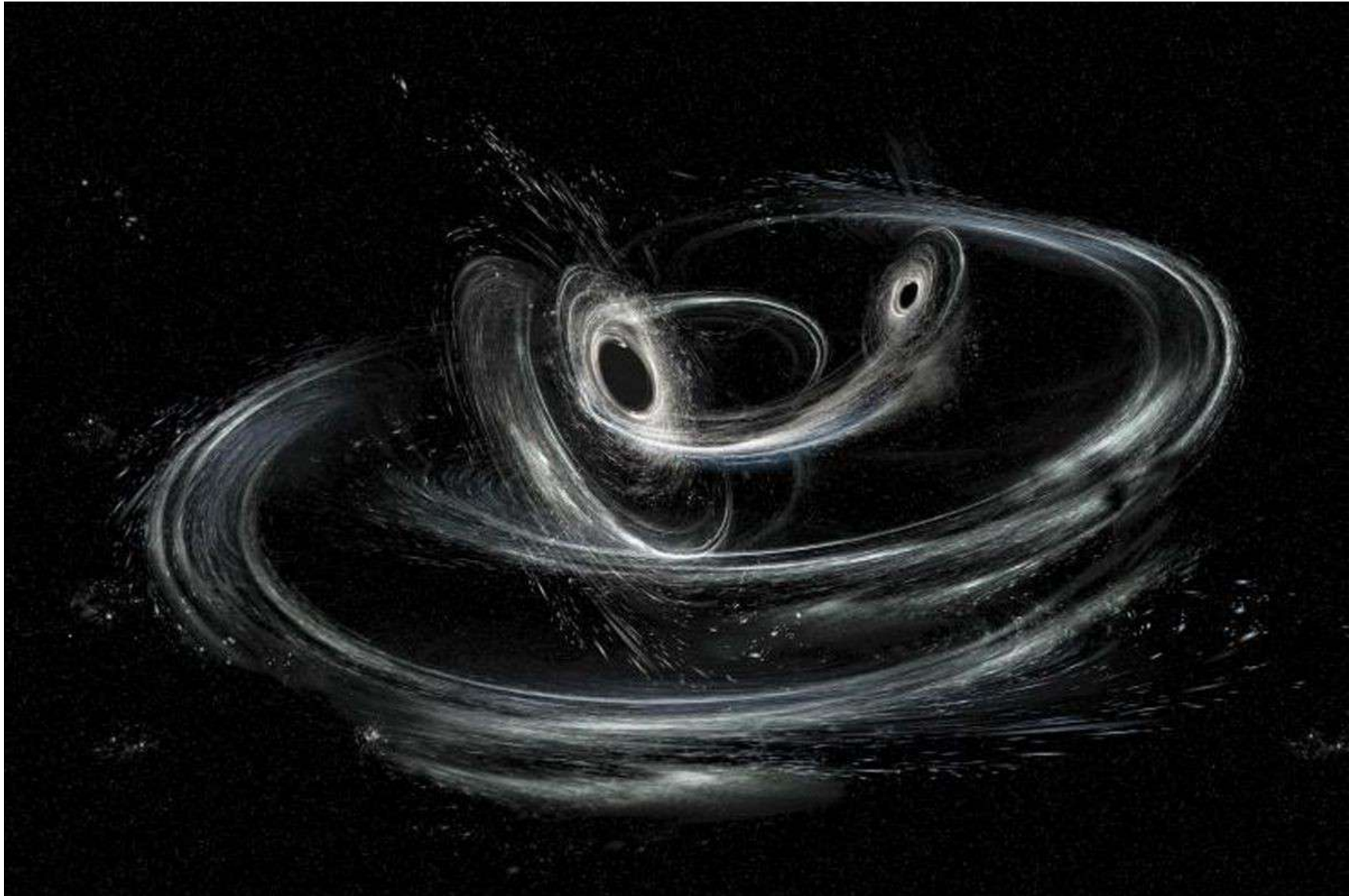
Astrofizički neutrini: kako ih opažamo?



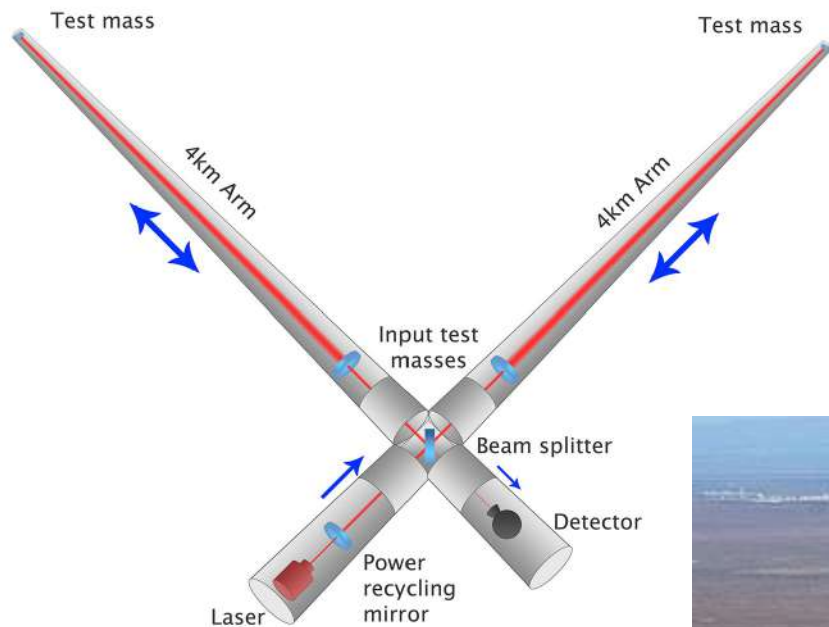
Gravitacijski valovi: što su?



Gravitacijski valovi: odakle dolaze?

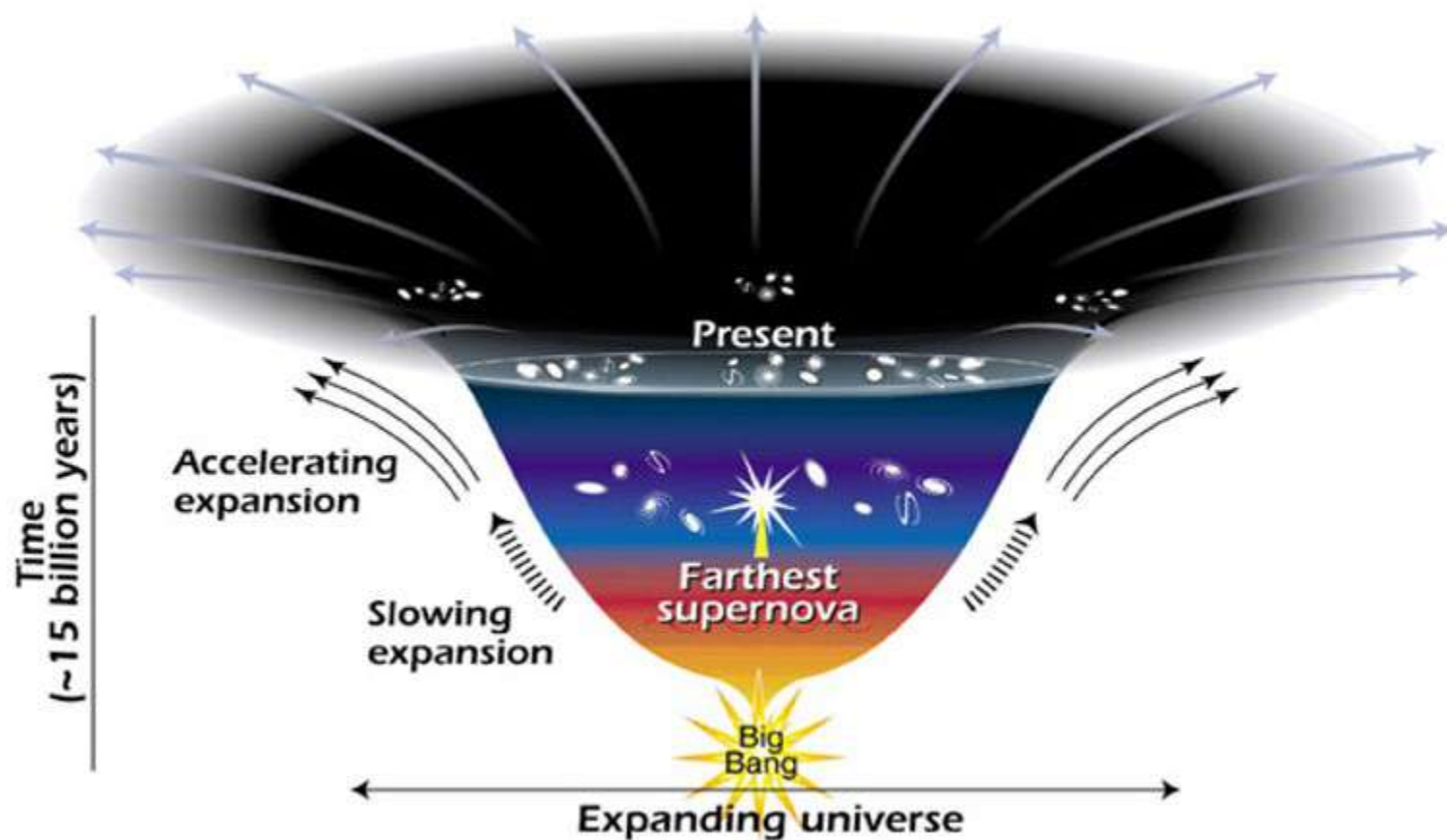


Gravitacijski valovi: kako ih opažamo?



Neke zanimljive činjenice

(do kojih smo došli zahvaljujući astročesticama)



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