New technologies for new discoveries in astronomy

Giant telescopes in space and on the ground

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Abstract:
Where did we come from, who are we, and where are we going? Astronomers worldwide are building and planning great new telescopes to see farther and better than ever before. Already under construction are the Square Kilometer Array in South Africa and Australia, the ALMA in the Chilean high desert, the Large Synoptic Survey Telescope, the Thirty Meter Telescope, the Giant Segmented Magellan Telescope, the European Extremely Large Telescope, and the James Webb Space Telescope (JWST), planned for launch in 2018. But thats not nearly enough: we are thinking about the next generations of space telescope, like High Definition Space Telescope, and future X-ray and gravitational wave observatories. All of these marvels are propelled by technology advances as well as by the thrill of possible discovery, and none of them are the end of the line either. I will illustrate what these great telescopes do, talk about the new inventions at their hearts, and outline what it takes to conceive a new observatory like the JWST and take it to completion. I will talk about the open questions of astronomy, why they are still open, and what we are doing to answer them. I will speculate a little on how far astronomy can take us, about progress with robots and artificial intelligence, and about our ultimate future as the galaxies collide and stars burn out.