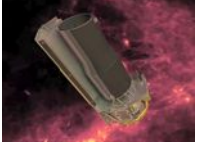
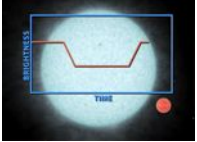
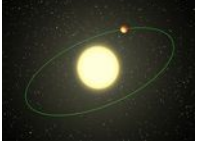
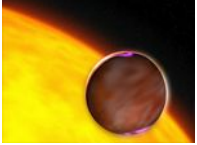


Hidden Universe #4: Night and Day on an Alien World	
It's as clear as day and night... but on an exotic alien world! Astronomers have for the first time measured the temperatures varying across the surface of a planet <i>beyond</i> our solar system.	
This is the Hidden Universe of the Spitzer Space Telescope, exploring the mysteries of infrared astronomy with your host, Dr. Robert Hurt.	
Planets orbiting other sun-like stars are notoriously difficult to observe; they're so distant that no telescope is yet powerful enough to photograph them directly. Their feeble light is blurred into the glare of the stars they orbit. Nonetheless, since 1995 astronomers have discovered over 200 extrasolar planets by observing the effects they have on their parent stars. These include gravitationally-induced wobbles, and even faint dimmings of the starlight when the planets pass in front.	
The infrared eye of the Spitzer Space Telescope has already proven to be an exciting tool for learning more about these alien worlds.	
In 2005, astronomers Drake Deming and Dave Charbinneau announced the first detection of light from two extrasolar planets, seen as they went into eclipse <i>behind</i> their stars.	
Now, astronomers Joe Harrington, of the University of Central Florida, and Brad Hansen, of UCLA, have taken this one step further. They have actually measured differences between the day and night sides of such a world.	
“So this particular system... this star is called Upsilon Andromedae because it's in the constellation Andromeda. And it's got three known planets orbiting it, named conventionally “B,” “C,” and “D.” And this particular one we're looking for is a signal from Upsilon Andromedae B. That's the closest planet. So this is a planet orbiting its parent star in a four and a half day orbital period. So it's much, much closer than any of the planets in our solar system are to its particular sun.”	
This planet isn't just an extra-hot “Mercury”. It's a gas giant as massive as Jupiter, and while there's nothing like it in our own solar system, astronomers have found it's far from unique. Many so-called “hot Jupiters” have been discovered around other stars,	

but very little is yet known about what these roasting balls of gas are really like.	
“And so the natural question that came about is how does this increased amount of energy they’re receiving from the sun affect the structure of the planet and its atmosphere? And so some models suggest in fact the light is absorbed and reradiated very quickly so the heat is coming out mostly on the day side rather than the night side, whereas other models suggest that maybe where there are very strong winds, such as give rise to the bands on Jupiter, then in fact energy can get redistributed around the planet quite evenly around the planet before it’s reemitted.”	
To test these models, Harrington and Hansen needed to observe this system in the infrared, where the planet emits most of its light. Though the star is over a hundred times brighter, Spitzer could still pick out the small variations in the combined brightness as the planet moved through its orbit.	
“So we went out to observe this system to see if there was a day/night temperature difference. And we found in fact there is a strong day/night temperature difference between the day side and the night side based on the fact we see this characteristic variation in the total light of the system over the course of four and a half days, in exactly the right phase and right time to correspond with this model where the day side is hot and the night side is cold.”	
The temperature difference is immense, over 2,500 degrees Fahrenheit, or 1,400 degrees Celsius, between the comfortably cool night side and the broiling hot spot facing the sun. This is vastly different from the infrared structure of Jupiter, which is even-temperated all around.	
This remarkable result marks the first time any kind of variation has been seen across the surface of a planet outside our solar system. For now only imaginative artists can provide pictures of what they could look like. But until the day we can take real snapshots, astronomers will continue to find clever ways to explore this growing catalog of alien worlds.	