

1	Dark Matter	5:13
2	Galactic Rotation	4:15
3	Dark Energy	4:24
4	Black-body Radiation	8:03
5	W.I.M.P.	8:27
6	Cosmology	5:35
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8	Alpha Forest	5:46
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10	Dark Galaxy	7:29
11	Majorana Particles	6:16
12	Axion	4:43
13	M-Theory	5:01

# DARK MATTER



  
**PERK X SOUND LABS**

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# dark matter

When cosmologists [6] first modeled galactic rotation [2] and the formation galaxies using the mass estimated from the light observable from earth, the models did not work correctly. It was only through the introduction of a significant amount of extra mass that the models began to match the observable motion of galaxies. Eventually scientist began to believe that this extra mass actually existed and it was given the name "dark matter" [1] since it emitted no observable light. The existence of dark matter can also be inferred from gravitational lensing [7], the bending of light by the gravity of mass that lies between the earth and distant stars. The mass of the observable universe not arising from dark matter is estimated from the alpha forest [8], the sum of absorption lines from the Lyman-alpha transitions of the neutral hydrogen atoms in the spectra of light from distant galaxies and quasars. Dark matter is not only invisible in the visible spectrum of light it is also invisible in the infrared spectrum. It is, therefore, not just non-reflective matter that doesn't emit light. The infrared radiation emitted by an opaque, non-reflective body at thermal equilibrium with its environment is called black-body radiation [4].

Dark matter is thought to be mainly composed of weakly interacting massive particles, WIMPs [5]. Many experiments are underway to attempt to directly observe dark matter particles. One of these is the DAMA/LIBRA [9] experiment being conducted in Italy. This experiment already has claimed to have observed dark matter particles, though many scientists remain skeptical. There are also experiments being conducted that will search for indirect evidence of dark matter. These experiments assume that WIMPs are Majorana particles [11], particles that are their own antiparticles. If so, then when two WIMPs collide that collision should produce significant gamma rays that can be detected. The axion [12] is hypothetical elementary particle that may also be a component of dark matter. The axion has no electric charge, a very small mass and very low weak and strong force interaction. There are also experiments underway to attempt to detect axions.

It is now thought that there exist galaxies composed entirely of dark matter. Models of the Big Bang and galactic structure formation suggest that these dark galaxies [10] should be very common in the universe. Another competing theory to explain the gravitation effects attributed to dark matter is M-Theory [13]. Some Superstring/M-Theory cosmologists propose that multi-dimensional forces from outside the visible universe have gravitational effects on the visible universe meaning that dark matter is not necessary for a unified theory of cosmology. Models of the expansion of the universe also did not match observations. The universe is expanding much faster than models predict. A new form of energy has been proposed to account for this higher rate of expansion. This dark energy [3] is a hypothetical form of energy that permeates all of space and tends to accelerate the expansion of the universe.

[1] Dark Matter 5:13 [2] Galactic Rotation 4:15 [3] Dark Energy 4:24 [4] Black-body Radiation 8:03 [5] W.I.M.P.† 8:27 [6] Cosmology 5:35 [7] Gravitational Lensing 4:12 [8] Alpha Forest 5:46 [9] Dama Libra 5:22 [10] Dark Galaxy 7:29 [11] Majorana Particles 6:16 [12] Axion 4:43 [13] M-Theory 5:01

† The song W.I.M.P. was composed using only sounds that I designed and synthesized myself. No sounds from sound libraries or "refills" were used.

I would like to acknowledge the Science Channel television program, "Through the Wormhole", hosted by Morgan Freeman, for inspiring the material on this album. This program explores the deepest mysteries of the universe and does an excellent job of explaining complex scientific material in layman's terms.

Other albums by perkXsoundlabs:

PSL 001 *String Theory* – June 15<sup>th</sup>, 2012

PSL 002 *Rápidamente* – October 15<sup>th</sup>, 2012

PSL 003 *Tranceformation* (Single) – October 2<sup>nd</sup>, 2012



*Photo by Kathy D. Wigal*

*Cover art by Paul Rolan Perkes*

I designed the cover art for this album inspired by the WMAP image of the background radiation of the universe left over from the big bang.

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