

ΑΝΑΖΗΤΩΝΤΑΣ την ΣΚΟΤΕΙΝΗ ΥΛΗ

ευχαριστούμε θερμά τους:
R. MICHAEL BARNETT
KAUSHIK DE
REINHARD SCHWIENHORST
MARKUS NORDBERG
CARMEN GARCIA
GEORGE F SMOOT III

για την άδεια τους να χρησιμοποιήσουμε σκηνές από την παραγωγή τους:
PHANTOM OF THE UNIVERSE
The Hunt for Dark Matter

αφήγηση
ΓΙΩΡΓΟΣ ΠΥΡΠΑΣΟΠΟΥΛΟΣ

narration
ARIS GERONTAKIS

σκηνοθετική επιμέλεια
ΠΑΝΑΓΙΩΤΗΣ ΣΙΜΟΠΟΥΛΟΣ

επιστημονική επιμέλεια & κείμενο αφήγησης
ΑΛΕΞΗΣ ΔΕΛΗΒΟΡΙΑΣ

μουσική & sound design
ΑΝΑΣΤΑΣΙΟΣ Κ. ΚΑΤΣΑΡΗΣ

διεύθυνση παραγωγής
ΜΑΝΟΣ ΚΙΤΣΩΝΑΣ

σύμβουλος παραγωγής
ΔΙΟΝΥΣΙΟΣ Π. ΣΙΜΟΠΟΥΛΟΣ

post-production video & compositor
ΓΙΑΝΝΗΣ ΒΑΜΒΑΚΑΣ

graphic design
ΕΥΓΕΝΙΑ ΣΤΑΒΑΡΗ

digital printing support
ΗΛΙΑΣ ΜΠΑΛΝΤΑΣ

τεχνικοί πλανηταρίου
ΦΙΛΙΠΠΟΣ ΛΟΥΒΑΡΗΣ
ΧΡΗΣΤΟΣ ΧΡΗΣΤΟΓΙΩΡΓΟΣ

PHANTOM OF THE UNIVERSE

The Hunt for Dark Matter

creator & executive producer
R. MICHAEL BARNETT

executive producers
R. MICHAEL BARNETT
KAUSHIK DE
REINHARD SCHWIENHORST
MARKUS NORDBERG
CARMEN GARCIA
GEORGE F SMOOT III

directed by
JOAO PEQUENAO

produced and written by
CAREY ANN STRELECKI

edited by
ROBERT LANDAU
ERICH WILHELM ZANDER
CAREY ANN STRELECKI
JOAO PEQUENAO

animation by
JESUS NUEVO ESPANA
JOSE MANUEL VEGA
JOSE VICENTE SANZ MARCH
RAUL COLOMER
IVAN PULIDO

technical director
JESUS NUEVO ESPANA

time-lapse photography by
JOSE FRANCISCO SALGADO

associate producers
LEVENT GUIDEMIR
MEAGHAN BOEING
RICHARD WILLIAM TOENES

production team at michigan state university:

planetarium director
SHANNON SCHMOLL

director emeritus
DAVID BATCH

production coordinator
JOHN FRENCH

associate editor
JENNIFER ISMIRLE
BEN STRAUSS

render farm administrators
BRIAN WOLFF
RUTHANN GREGORY

animators
BRIAN WOLFF
CHRISTOPHER EDWARDS
BENJAMIN DIEFENBACH

advisor
JOHN RITZ

image credits:

galaxy evolution and merger from 16 million to 13.7 billion years old

BRIAN O'SHEA (MSU)
MICHAEL NORMAN
DONNA COX
ROBERT M PATTERSON
NATIONAL CENTER FOR SUPERCOMPUTING APPLICATIONS
UNIVERSITY OF ILLINOIS AT URBANA-CHAMPAIGN

dark matter halo
KAVLI INSTITUTE FOR PARTICLE ASTROPHYSICS AND COSMOLOGY
SLAC NATIONAL ACCELERATOR LABORATORY

HAO-YI "HEIDI" WU
OLIVER HAHN
RISA WECHSLER
TOM ABEL
RALPH KAEHLER (visualization)

galaxy merger
KAVLI INSTITUTE FOR PARTICLE ASTROPHYSICS AND COSMOLOGY
SLAC NATIONAL ACCELERATOR LABORATORY

JI-HOON KIM
TOM ABEL

RALPH KAEHLER (visualization)

first stars: population III stars in a proto-galaxy
**KAVLI INSTITUTE FOR PARTICLE ASTROPHYSICS AND COSMOLOGY
SLAC NATIONAL ACCELERATOR LABORATORY**

JOHN WISE

TOM ABEL

RALPH KAEHLER (visualization)

dark matter streams
**KAVLI INSTITUTE FOR PARTICLE ASTROPHYSICS AND COSMOLOGY
SLAC NATIONAL ACCELERATOR LABORATORY**

OLIVER HAHN

TOM ABEL

RALPH KAEHLER (visualization)

photo of fritz zwicky
**THE ARCHIVES, CALIFORNIA INSTITUTE OF TECHNOLOGY
FLOYD CLARK (photo by)**

installing the atlas calorimeter
**CERN, THE ATLAS EXPERIMENT
MAXIMILIEN BRICE (photo by)**

image of the nobel prize
© THE NOBEL FOUNDATION

journal cover "physics letter b"
© 2012-2016 ELSEVIER

**an atlas event with 2 photons
CERN, THE ATLAS EXPERIMENT**

the standard model of fundamental particles and interactions
**CONTEMPORARY PHYSICS EDUCATION PROJECT
U.S. DEPARTMENT OF ENERGY
U.S. NATIONAL SCIENCE FOUNDATION
LAWRENCE BERKELEY NATIONAL LABORATORY**

cms: simulated higgs to two jets and two elements
LUCAS TAYLOR (cern image creator)

cover of "physical review d: particles, fields, gravitation,
and cosmology-review of particle physics"
(2012) (Part 1 July 2012 volume 86 number 1)
AMERICAN PHYSICAL SOCIETY

cover of "the charm of strange quarks:
mysteries and revolutions of particle physics"
SPRINGER PUBLISHING COMPANY

MICHAEL R. BARNETT (book by)
HENRY MUHRY (book by)
HELEN R. QUINN (book by)

cover of "the god particle: if the universe is the answer,
what is the question?"

DELL PUBLISHING / RANDOM HOUSE
LEON LEDERMAN (book by)

"atlas event displays"
CERN

professor higgs poster

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ALEXANDER MAHMOUD (based on the photograph by)

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ATLAS EXPERIMENT

LAWRENCE BERKELEY NATIONAL LABORATORY

MICHIGAN STATE UNIVERSITY

UNIVERSITY OF TEXAS AT ARLINGTON

CERN (GENEVA, SWITZERLAND)

SCIENCE & TECHNOLOGY FACILITIES COUNCIL (UK)

INSTITUTO DE FISICA CORPUSCULAR, IFIC (SPAIN)

INSTITUT FUR HOCHENERGIEPHYSIK DER OSTERREICHISCHEN

AKADEMIE DER WISSENSCHAFFEN

NATURHISTORISCHES MUSEUM WIEN

DESY, DEUTSCHES ELEKTRONEN-SYNCHOTRON (GERMANY)

CERN/ATLAS IMAGES

Geneva, Switzerland

movement of atlas big wheel

© 2017 **THE ATLAS EXPERIMENT, CERN**

footage atlas control room

© 2009 **CERN**

atlas solenoid placed in its final position

© 2004 **CERN**

DENVER MUSEUM OF NATURE & SCIENCE

Denver, Colorado

supervisor

THOMAS LUCAS

producers

MATTHEW BROWNELL

DONNA COX

DANIEL NEAFUS

ROBERT PATTERSON

JOSLYN SCHOEMER

ESO IMAGES

Munich, Germany

alma trailer without text

ESO

ALMA (ESO/NAOJ/NRAO)

C. MALIN (chrisophmalin.com)

P. HORALEK

LIAM YOUNG

B. TAFRESHI (twanight.org)

J. J. TOBIN (University of Oklahoma/Leiden University)

M. KAUFMAN

THEOFANIS N. MATSOPOULOS

H. H. HEYER

S. ARGANDONA

H. ZODET

alma uhd video compilation

ALMA (ESO/NAOJ/NRAO)

the aquarius simulation

VOLKER SPRINGEL

THE VIRGO COLLABORATION

eso's la silla telescopes in 2016

ESO

illustris simulation of the universe's evolution in 8k fulldome

THE ILLUSTRIS PROJECT (visualization by DYLAN NELSON)

paranal observatory compilation 2017

ESO

very large telescope uhd video compilation

ESO

FULLDOMELAB IMMERSIVE MEDIA

ChiangMai, Thailand

supervisor
YURIY GAPON

executive producer
YAROSLAV GUBCHENKO

producers
GEORGIY AISTOV
MAKSIM GOGOLEV
YAROSLAV GUBCHENKO
OLGA KOZAKOVSKA
ALEKSANDR SAMILENKO

production designer
ANASTASIA SHILOVA

cgi supervisor
VLADIMIR PERMINOV

cgi artists
VALENTINE MEDVEDEV
ANASTASIA SHILOVA
VLADIMIR PERMINOV
ALEXEY BARTASHEVICH
ALEXANDER POTEKHIN
YURIY GAPON

graphics
YULIYA TATSKO
OLGA NAZARENKO

animation
YURIY GAPON

programmer
ALEKSANDR BEREZOVSKY

HUBBLE SPACE TELESCOPE IMAGES

European Space Agency

a distorted archive of ancient relics

NASA
ESA

fulldome 3d animation of supernova explosion

ESA/HUBBLE
L. CALCADA
NICK RISINGER (skysurvey.org)

hubble space telescope
ESA/HUBBLE
M. KORNMESSE
L. L. CHRISTENSEN

hubble orbiting earth
NASA
ESA
M. KORNMESSE

ICECUBE IMAGES

South Pole Neutrino Observatory

the icecube lab
ICECUBE/NSF

icecube: a cherenkov neutrino telescope
ICECUBE COLLABORATION

cherenkov photons generated by an electron in icecube
ICECUBE COLLABORATION

cherenkov photons generated from a muon traversing icecube
ICECUBE COLLABORATION

deployment of last sensor
ICECUBE/NSF

LSST IMAGES

Cerro Pachon, Coquimbo Region, Chile

animation of lsst collage
LSST
NSF
AURA

MIRAGE 3D STUDIO

The Hague, Netherlands

producer & animation director
ROBIN SIP

senior animators
KEES VAN DER VIJVER
MATHIJS BRUSSAARD

PETER GEERTS

animators

RICK VAN REENEN
JOHANNES BEVELANDER
TONI VAN VELZEN
STIJN CAN KOOPEREN
BRYAN NOTER
JEROEN TANIS
RICK VAN DEN BERG
WIJNAND KOREMAN
ALEXANDER HAUG
MAURICE VAN RIJSINGE
MARK VERKERK

MUSEUM OF SCIENCE

Boston, Massachusetts

supervisors

DANIELLE KHOURY LeBLANC
ALAN LIGHTMAN

executive producers

IOANNIS MIAOULIS
PAUL FONTAINE
DAVID RABKIN

animation & effects artists

CHARLES WILCOX
WADE SYLVESTER
HEATHER FAIRWEATHER
JASON FLETCHER

systems & technical coordinator

DARRYL DAVIS

NASA IMAGES

Washington, D.C.

jwtst spacecraft deploy animation

NASA/GODDARD SPACE FLIGHT CENTER

flyby of jwtst at l2 point

NASA
SKYWORKS DIGITAL
NORTHROP GRUMMAN
STSci

NORTHDOCKS

Kiel, Germany

supervisor

ADAM MAJOROSI

art director

MICHEL MAGENS

lead 3d artist

BOB WEBER

lead fx artist

MARTIN KOSSMANN

3d artists

JOACHIM PERSCHBACHER

MICHEL MAGENS

WOLF RUSMANN

SVENJA KAMPO

MICHA TWARDY

data conversion

ALEXANDER GROFENSTEIN

milky way simulation

ALEXANDER BINDEUS

CHRISTIAN GOSCHI

SOFTMACHINE

Munich, Germany

supervisor

PETER POPP

producer

RITA-GRACIELA WERNER

production designer

ECKHARD ROCHOLL

technical director

ROBERT ZELTSCH

co-art director

CHRIS DREHER

SKY-SKAN

Nashua, New Hampshire

producer

JACK WHITE

executive producer

STEVEN T. SAVAGE

technical director

KEVIN BEAULIEU

compositing

JOANNA GARDENER

KEVIN BEAULIEU

DAVID MILLER

animator

DAVID MILLER

fulldome & post-production video services

ΕΥΓΕΝΙΔΕΙΟ ΠΛΑΝΗΤΑΡΙΟ

post-production audio services

STARGAZER AUDIO

Ιδρύματος Ευγενίδου

παραγωγή

ΙΔΡΥΜΑ ΕΥΓΕΝΙΔΟΥ

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