



Movies vs Astronomy

Science fact or science fiction?

Jonathan Crass



Movies vs Astronomy

- Science Fiction vs Science Fantasy
- Recent Science Fiction Movies
 - Gravity
 - The Martian
 - Interstellar

Fiction vs Fantasy

Astronomy based movies

- There are three main types of movies with a space based background:
 - Aliens
 - The Future
 - Human Space Flight
- Within these, there are:
 - Those which attempt to stay within the realms of science
 - Those which don't...

Science Fiction

From the Academy Award-Winning Director of "Forrest Gump" and Pulitzer Prize-Winning Author of "Contact."

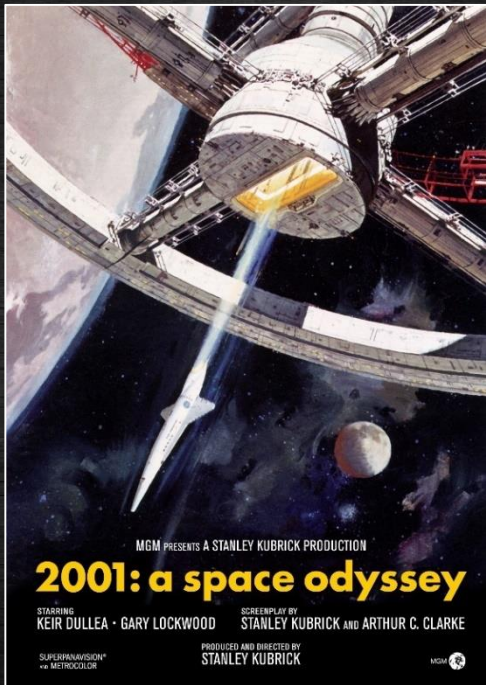
JODIE FOSTER
MATTHEW MCCONAUGHEY

A message from deep space.
Who will be the first to go?
A journey to the heart of the universe.

CONTACT

WARNER BROS. PICTURES PRESENTS A WARNER BROS. PICTURES PRODUCTION "CONTACT" A FILM BY ROBERT ZEMECKIS CASTING BY ROBERT ZEMECKIS EXECUTIVE PRODUCERS JAMES WAXSON JOHN HURT TOM SELBY AND GARY BARRETT PRODUCED BY RICHARD J. BRADY AND RICHARD STODOLKIN WRITTEN BY JEFFREY LUGER AND RICHARD STODOLKIN DIRECTED BY ROBERT ZEMECKIS

MPAA RATED PG-13 PARENTS STRONGLY CAUTIONED SOME MATERIAL MAY BE INAPPROPRIATE FOR CHILDREN UNDER 13



MGM PRESENTS A STANLEY KUBRICK PRODUCTION

2001: a space odyssey

STARRING KEIR DULLEA · GARY LOCKWOOD SCREENPLAY BY STANLEY KUBRICK AND ARTHUR C. CLARKE PRODUCED AND DIRECTED BY STANLEY KUBRICK

SUPERFANAVISION™ BY METROCOLOR

TOM HANKS KEVIN BACON BILL PAXTON GARY SINISE ED HARRIS

"Houston, we have a problem."

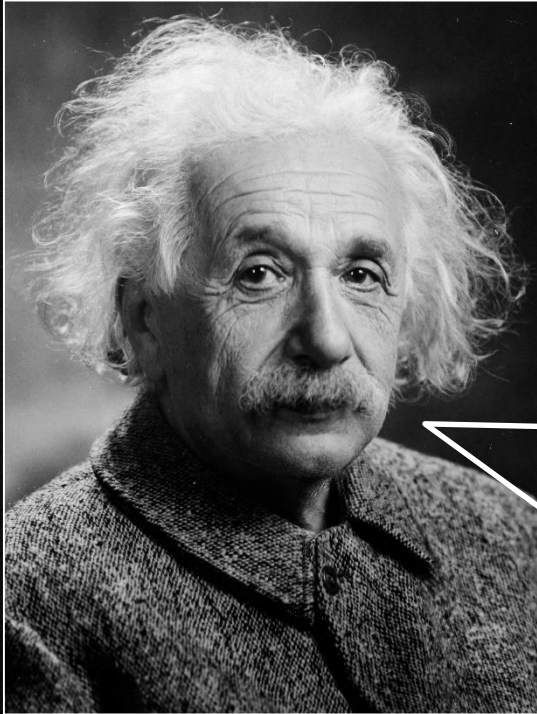
RON HOWARD PRESENTS

APOLLO 13

IMAGINE ENTERTAINMENT PRESENTS A FILM BY RON HOWARD CASTING BY BRYAN GRAZER EXECUTIVE PRODUCERS "APOLLO 13" KATHLEEN O'NEILL JAMES MCINER PRODUCED BY BRYAN GRAZER AND RON HOWARD WRITTEN BY ALBIN KRIEGER AND JERRY BRUCKHEIMER DIRECTED BY RON HOWARD

MPAA RATED PG-13 PARENTS STRONGLY CAUTIONED SOME MATERIAL MAY BE INAPPROPRIATE FOR CHILDREN UNDER 13

Science Fantasy



Under no circumstances
can you travel faster than
the speed of light.

ABSOLUTELY NOT!





Recent Science Fiction Movies

DON'T

LET

GO

SANDRA BULLOCK
GEORGE CLOONEY

FROM DIRECTOR ALFONSO CUARÓN

GRAVITY

WARNER BROS. PICTURES PRESENTS

AN ESPERANTO FILMO/JHEYDAY FILMS PRODUCTION AN ALFONSO CUARÓN FILM SANDRA BULLOCK, GEORGE CLOONEY
"GRAVITY" MUSIC BY STEVEN PRICE COSTUME DESIGNER JANY TEMME VISUAL EFFECTS SUPERVISOR TIM WEBBER EDITORS ALFONSO CUARÓN, MARK SANGER
PRODUCTION DESIGNER ANDY NICHOLSON DIRECTOR OF PHOTOGRAPHY EMMANUEL LUBEZKI, A.S.C., A.M.C. EXECUTIVE PRODUCERS CHRIS DE FARIA, NIKKI PENNY, STEPHEN JONES
WRITTEN BY ALFONSO CUARÓN & JONÁS CUARÓN PRODUCED BY ALFONSO CUARÓN, DAVID HEYMAN
DIRECTED BY ALFONSO CUARÓN

gravity-movie.net

MPAA RATED PG-13

SEE IT IN 2D AND 3D

WARNER BROS. PICTURES
A Time Warner Entertainment Company, L.P. Presentation
A Warner Bros. Entertainment Company

OCTOBER

DON'T

LET

GO

SANDRA BULLOCK
GEORGE CLOONEY

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GRAVITY

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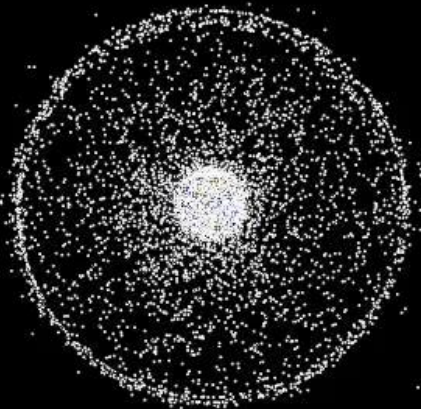
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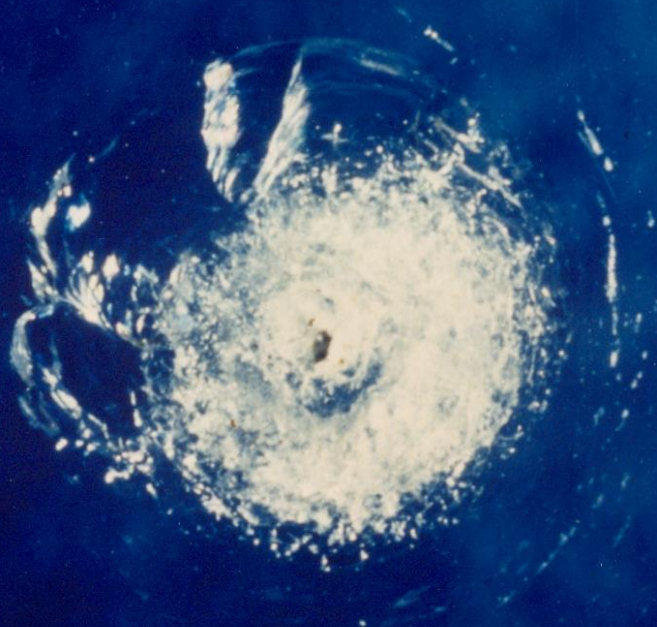
OCTOBER



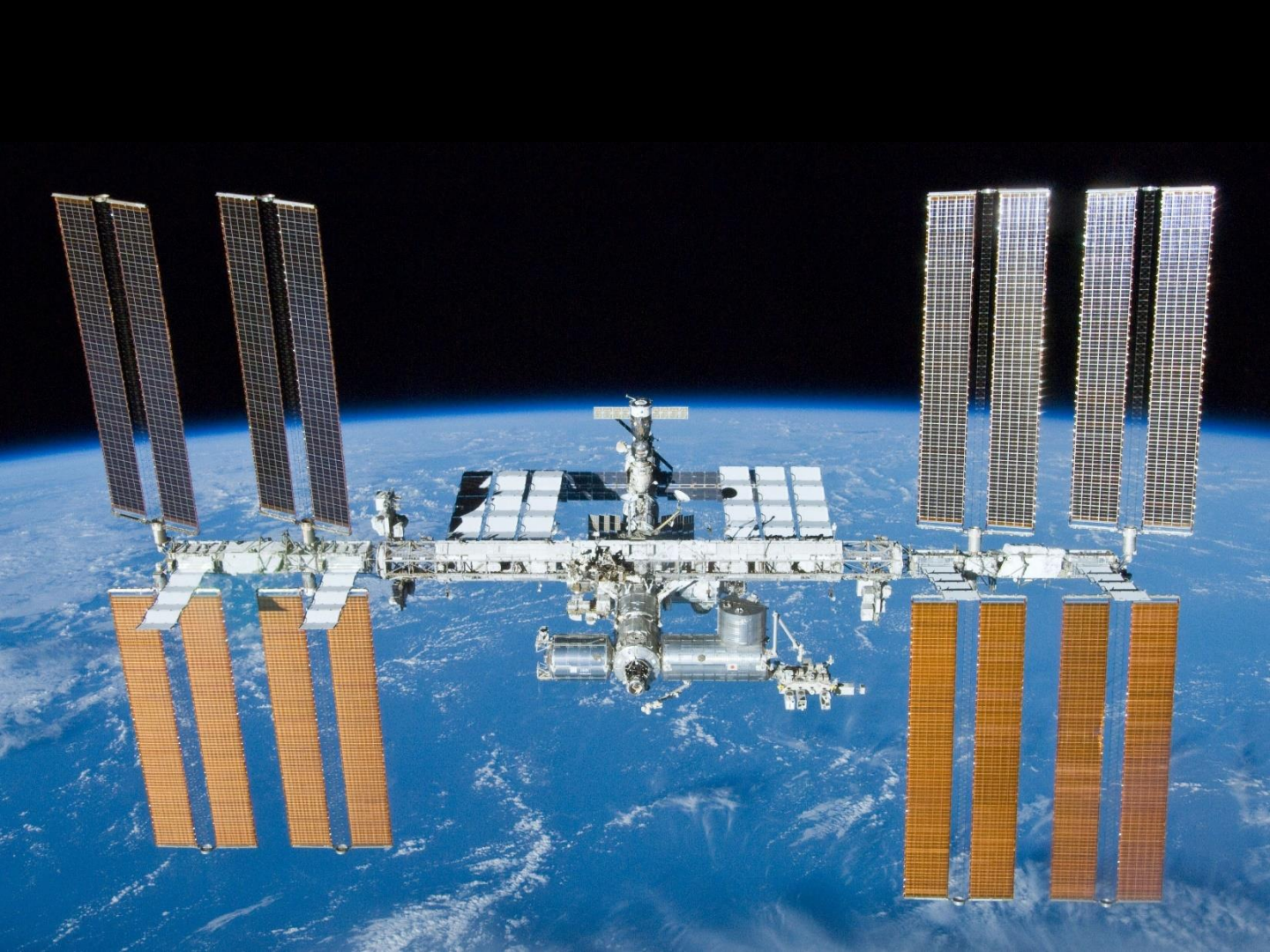
“The greatest risk to
space missions comes
from non-trackable
debris”

Nicholas Johnson
NASA chief scientist for orbital debris

STS-7 Window Pit



1mm



Fire and tears







The GOOD

- The repeated orbital debris impacts
- The speed of the oncoming debris
- The transition from the vacuum of space
 - Silence in space
 - Sound in a pressurised airlock


The BAD

- Satellite communications being disrupted
- The HST, ISS and Tiangong-I being close enough to travel between them
- Momentum
 - For every action there is an equal and opposite reaction





Other Opinions

 **Neil deGrasse Tyson** 
@neiltyson  


Mysteries of **#Gravity**: Why Bullock, a medical Doctor, is servicing the Hubble Space Telescope.

RETWEETS 1,488 LIKES 1,184 





11:50 PM - 6 Oct 2013

 **Neil deGrasse Tyson** 
@neiltyson  


Mysteries of **#Gravity**: Why Bullock's hair, in otherwise convincing zero-G scenes, did not float freely on her head.

RETWEETS 1,056 LIKES 836 

12:15 AM - 7 Oct 2013

 **Neil deGrasse Tyson** 
@neiltyson  

Mysteries of **#Gravity**: How Hubble (350mi up) ISS (230mi up) & a Chinese Space Station are all in sight lines of one another.

RETWEETS 1,119 LIKES 827 

12:00 AM - 7 Oct 2013

 **Neil deGrasse Tyson** 
@neiltyson  

The film **#Gravity** should be renamed "Zero Gravity"

RETWEETS 1,312 LIKES 1,079 

11:35 PM - 6 Oct 2013

A RIDLEY SCOTT FILM

HELP IS ONLY 140 MILLION MILES AWAY



MATT DAMON

THE MARTIAN

TWENTIETH CENTURY FOX PRESENTS A SCOTT FREE / KINDERGEMINE PRODUCTION A RIDLEY SCOTT FILM MATT DAMON "THE MARTIAN" JESSICA CHASTAIN KRISTEN WIGG JEFF DANIELS MICHAEL PENK KATE MARA
SEAN BEAN SEBASTIAN STAN ANSEL ELVINE AND CHRIVETEL LALUFIN "PHARRY GIBSON-WELIANG" SARA JANTY VAYES AND PIETRO SCALIA AND "GEO" ARTHUR MAX AND "GEO" DANHUSE WOLSKAI AND
PROD BY SIMON KINDERGEMINE RIDLEY SCOTT AND MICHAEL SCHAEFER AND ADITYA SODI AMAR RUFAM AND WRITTEN BY ANDY WEIR AND PROD BY BREW GOODARD AND RIDLEY SCOTT

IN CINEMAS SEPTEMBER 30 IN 3D

#TheMartian



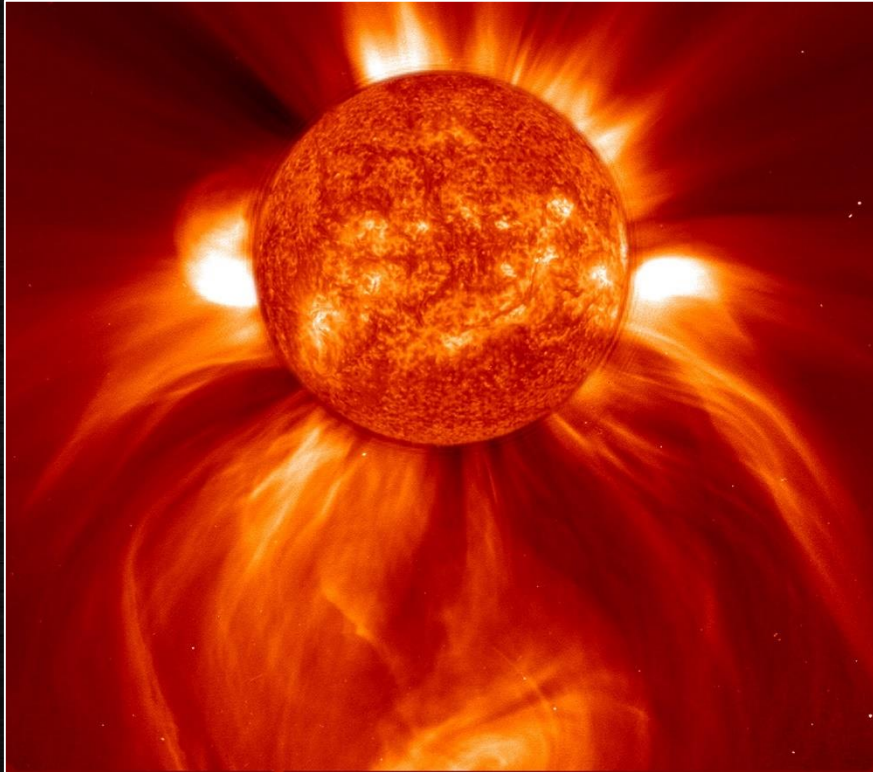


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Radiation



The Problem of Food



The air to breathe...

Oxygen

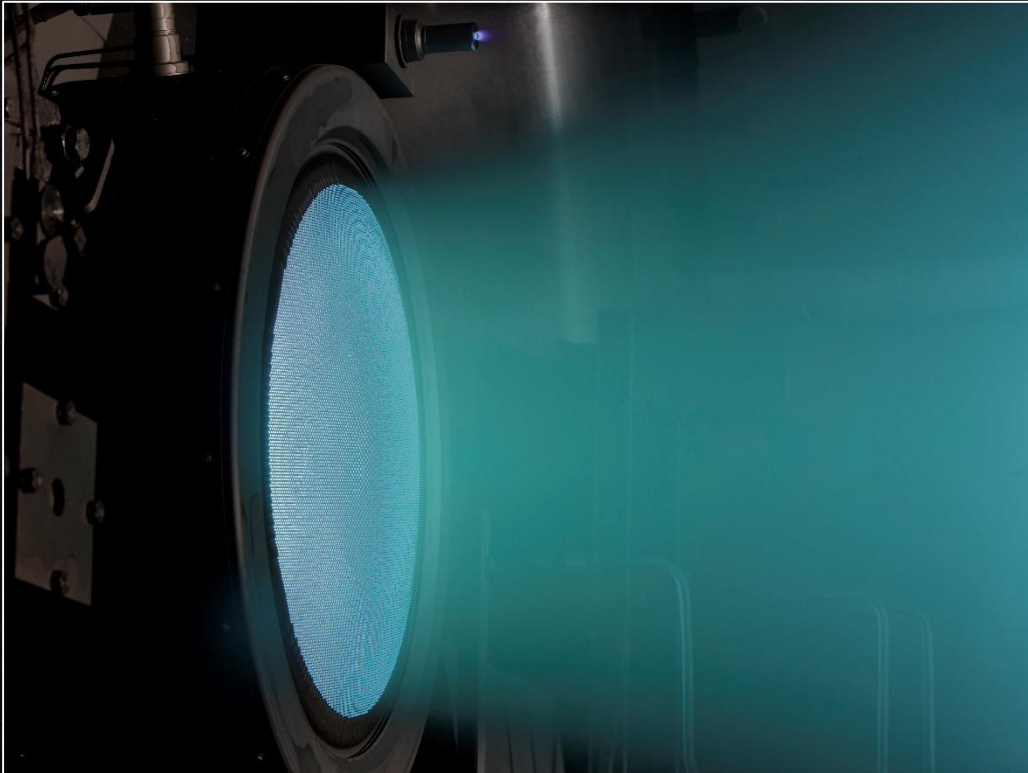
Transport



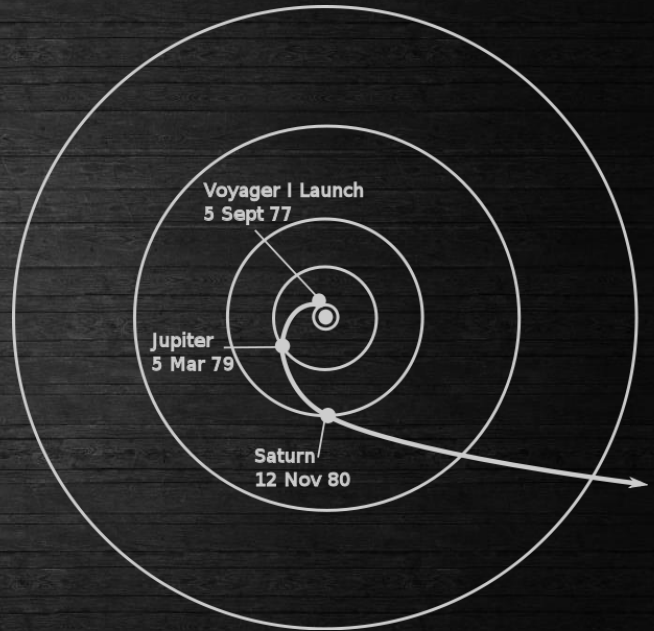
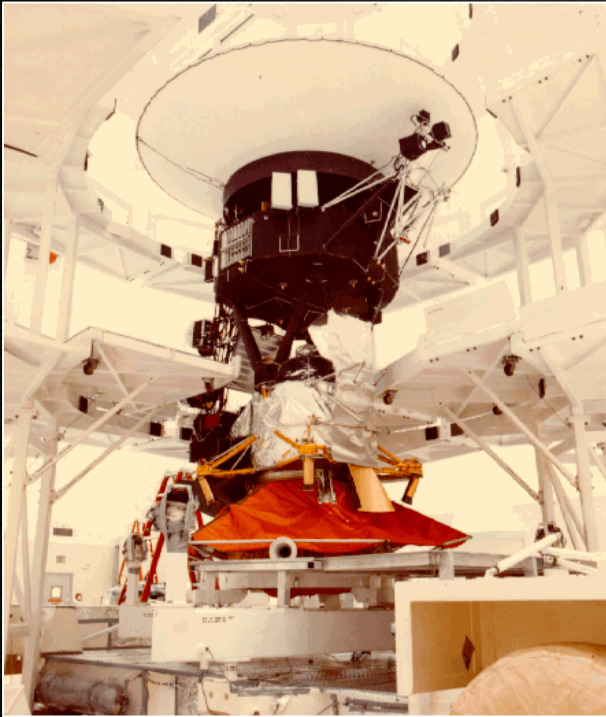
The Hermes



Ion Drives



Gravity Assists/Flyby



MATTHEW
McCONAUGHEY

ANNE
HATHAWAY

JESSICA
CHASTAIN

MICHAEL
AND
CAINE



THE END OF EARTH WILL NOT BE THE END OF US.

A FILM BY CHRISTOPHER NOLAN

INTERSTELLAR

PARAMOUNT PICTURES AND WARNER BROS. PICTURES PRESENT
A SYNOPTA LINDA OBST PRODUCTIONS PRODUCTION
A FILM BY CHRISTOPHER NOLAN
CASTING BY MATTHEW MCGONAGLE
COSTUME DESIGNER ANNE HATHAWAY
EXECUTIVE PRODUCERS JESSICA CHASTAIN, BILLY BRAUN, ELLIEN BURSTYN, AND MICHAEL CAINE
PRODUCED BY MARY ZUPPES
SCREENPLAY BY JONATHAN NOLAN AND CHRISTOPHER NOLAN
DIRECTED BY CHRISTOPHER NOLAN
EDITED BY LEANNE SMITH
EXECUTIVE PRODUCERS KATHY AN GROWLEY, JONATHAN GROWLEY, DON TEXAS, BOYDEAN, AND
PRODUCED BY JORDAN GOLDBERG, KATHY AN GROWLEY, MATTI TORNE, THOMAS STILLA
EXECUTIVE PRODUCERS JONATHAN NOLAN AND CHRISTOPHER NOLAN
PRODUCED BY EMMA THOMAS, CHRISTOPHER NOLAN, LINDA OBST
DIRECTED BY CHRISTOPHER NOLAN

IN THEATRES AND IMAX

EVERYWHERE
NOVEMBER 7

interstellarmovie.com interstellar.com

MATTHEW
McCONAUGHEY

ANNE
HATHAWAY

JESSICA
CHASTAIN

MICHAEL
AND
CAINE



THE END OF EARTH WILL NOT BE THE END OF US.

A FILM BY CHRISTOPHER NOLAN

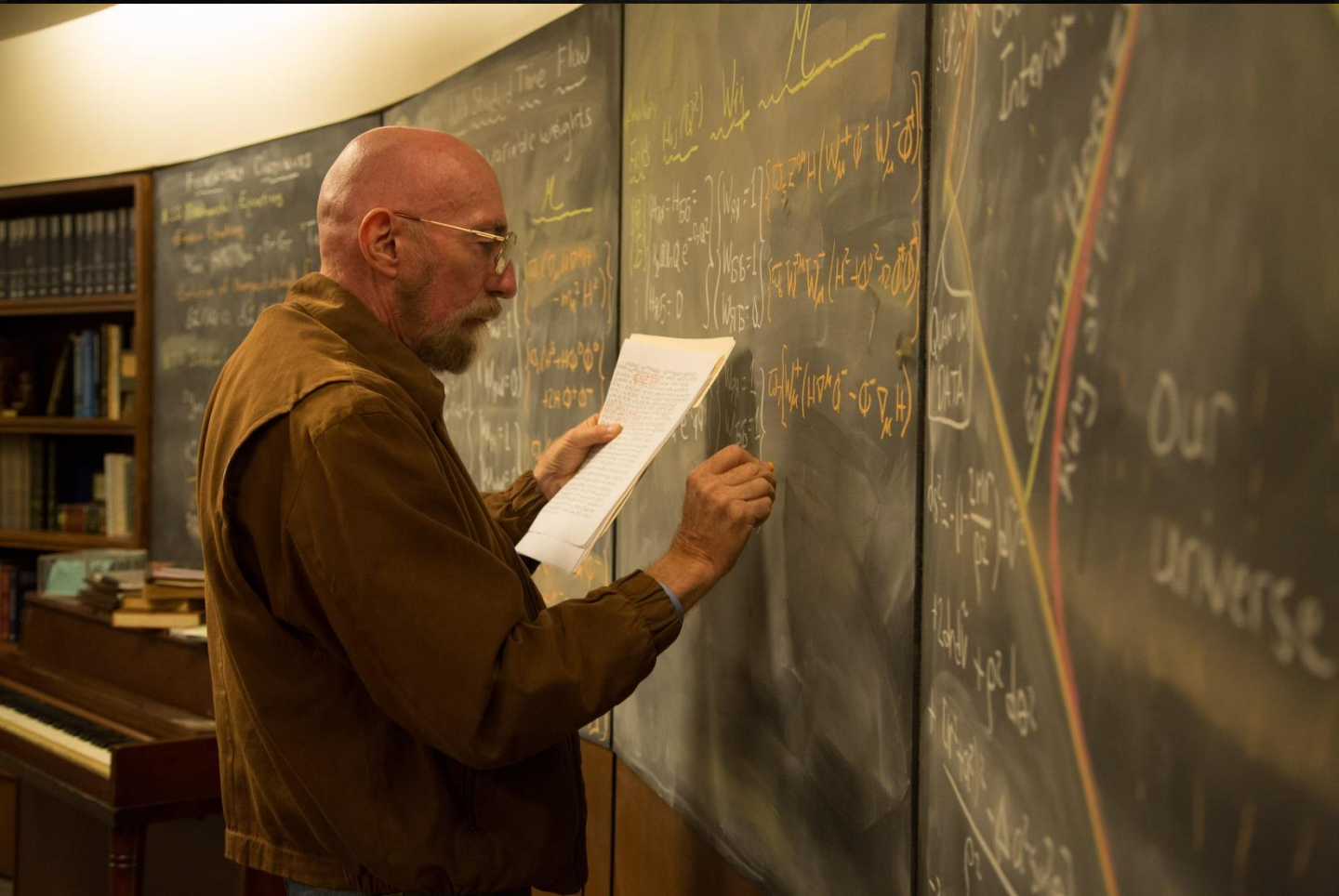
INTERSTELLAR

PARAMOUNT PICTURES AND WARNER BROS. PICTURES PRESENT
A SYNOPTA LINDA OBST PRODUCTION
A FILM BY CHRISTOPHER NOLAN
CASTING BY NATALIE SELLARS
COSTUME DESIGNER MATTHEW McCONAUGHEY ANNE HATHAWAY
JESSICA CHASTAIN BILL IRVIN ELLEN BURSTYN AND MICHAEL CAINE
COSTUME DESIGNER MARY ZUPPES
MUSIC BY JONAS ZIMMER
EDITED BY LEES SMITH AND JESSICA KATHAN GROWLEY
PRODUCTION DESIGNER DON TEXAS
PRODUCTION MANAGER LISA ASHCROFT
EXECUTIVE PRODUCERS JORDAN KOLEBERG AND JAMES MUEBS
PRODUCED BY EMMA THOMAS
CHRISTOPHER NOLAN LINDA OBST
WRITTEN BY JONATHAN NOLAN AND CHRISTOPHER NOLAN
DIRECTED BY CHRISTOPHER NOLAN

IN THEATRES AND IMAX
EVERYWHERE
NOVEMBER 7

interstellarmovie.com interstellar.com

The beginnings of Interstellar



Time Flow
variable weights

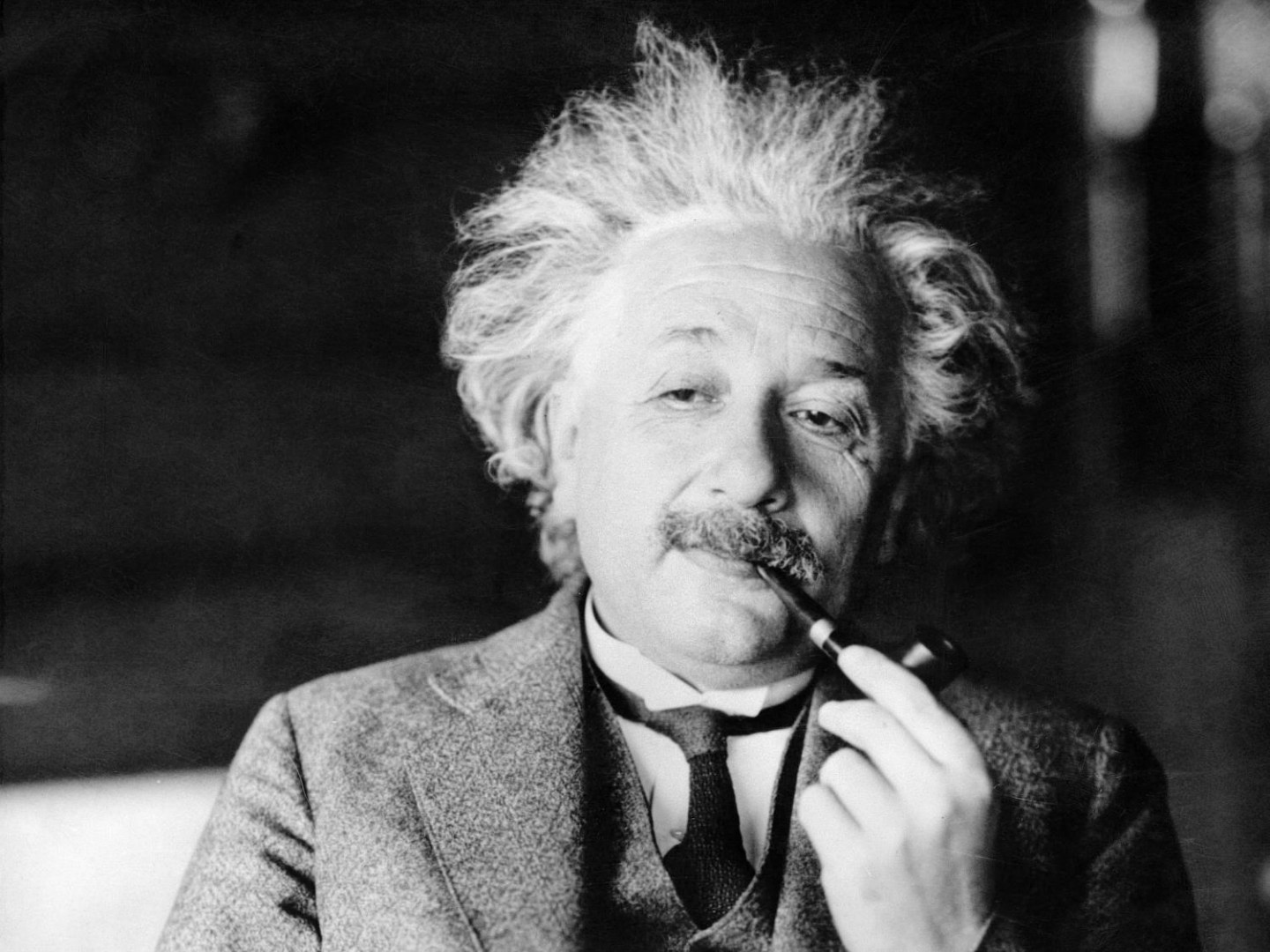
Fractal Curves
1.3 Dimensional Exponent
Fractal Scaling
Dimension of Fractal
Self-similarity

Handwritten notes in a notebook, partially visible, containing mathematical derivations.

$$\begin{aligned} \text{Laplacian } \nabla^2 \psi &= \frac{1}{r^2} \frac{\partial}{\partial r} \left(r^2 \frac{\partial \psi}{\partial r} \right) + \frac{1}{r^2 \sin^2 \theta} \frac{\partial^2 \psi}{\partial \phi^2} \\ \text{Wave Equation } \nabla^2 \psi &= -k^2 \psi \\ \text{Schrödinger Equation } \nabla^2 \psi &= -2m(E - V)\psi \end{aligned}$$



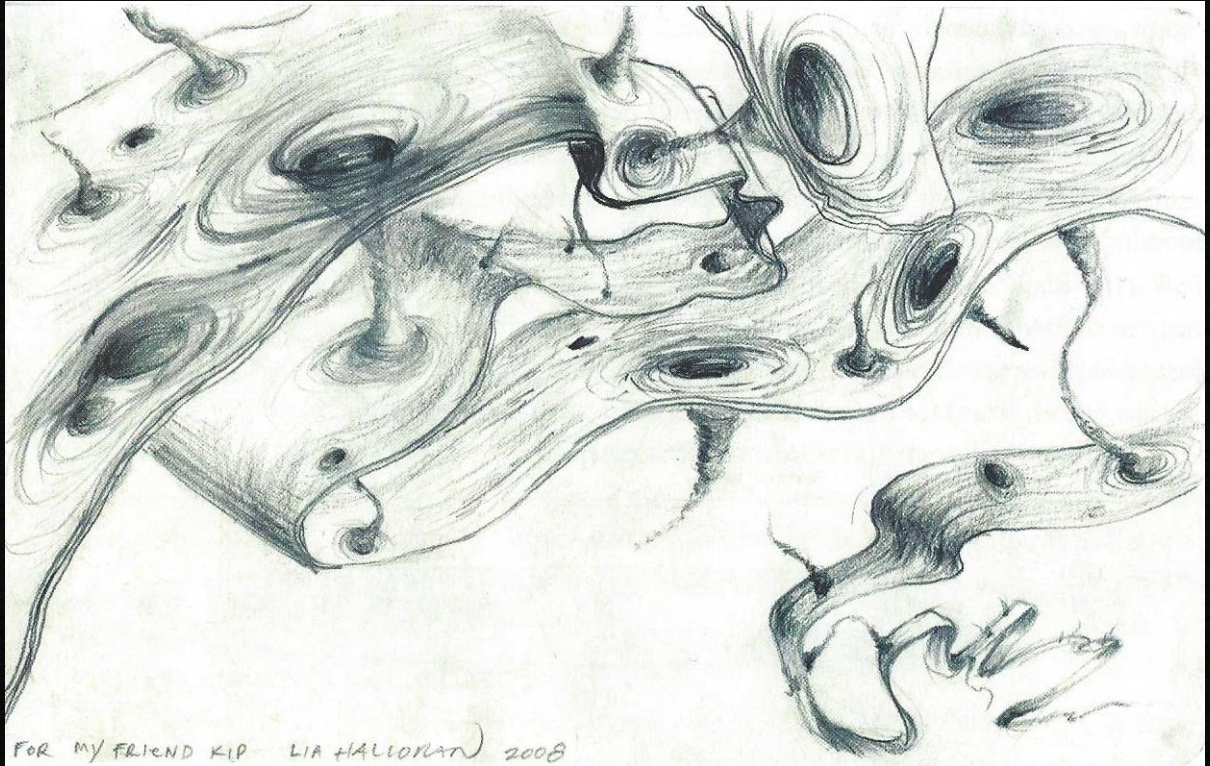
Our Universe



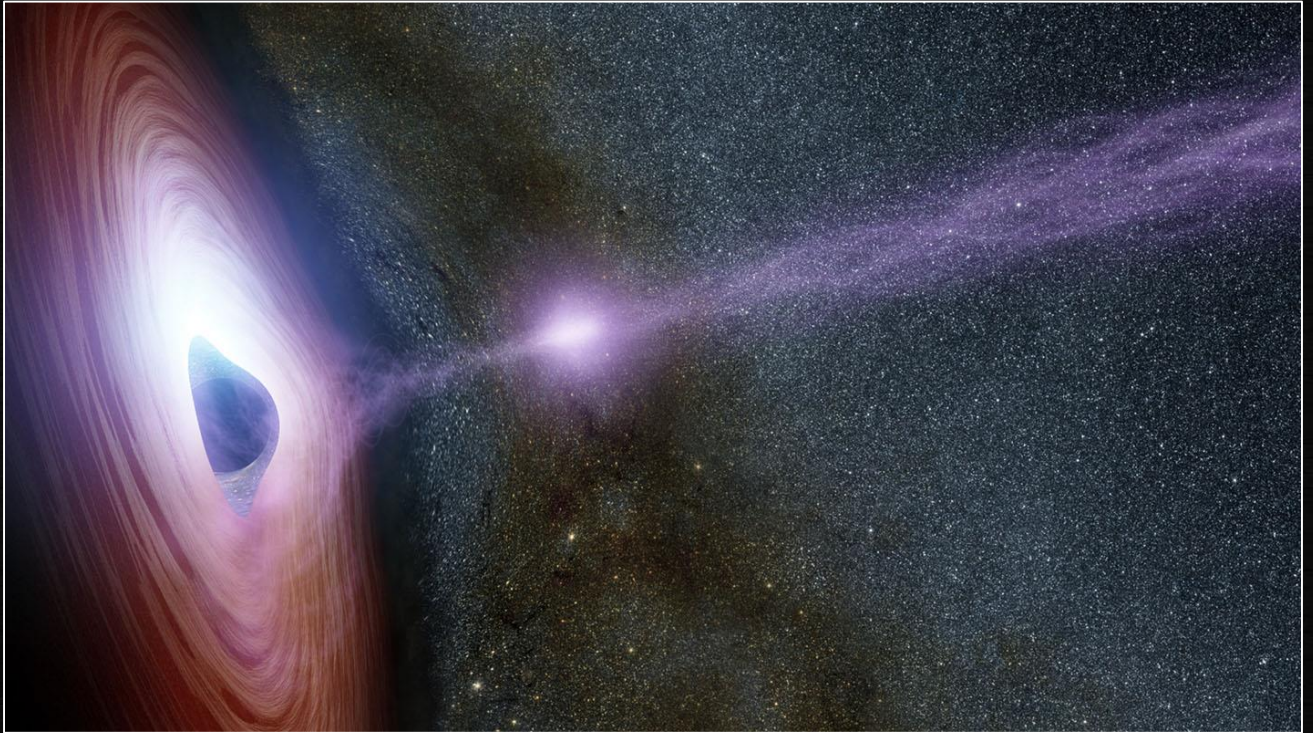
Higher Dimensions

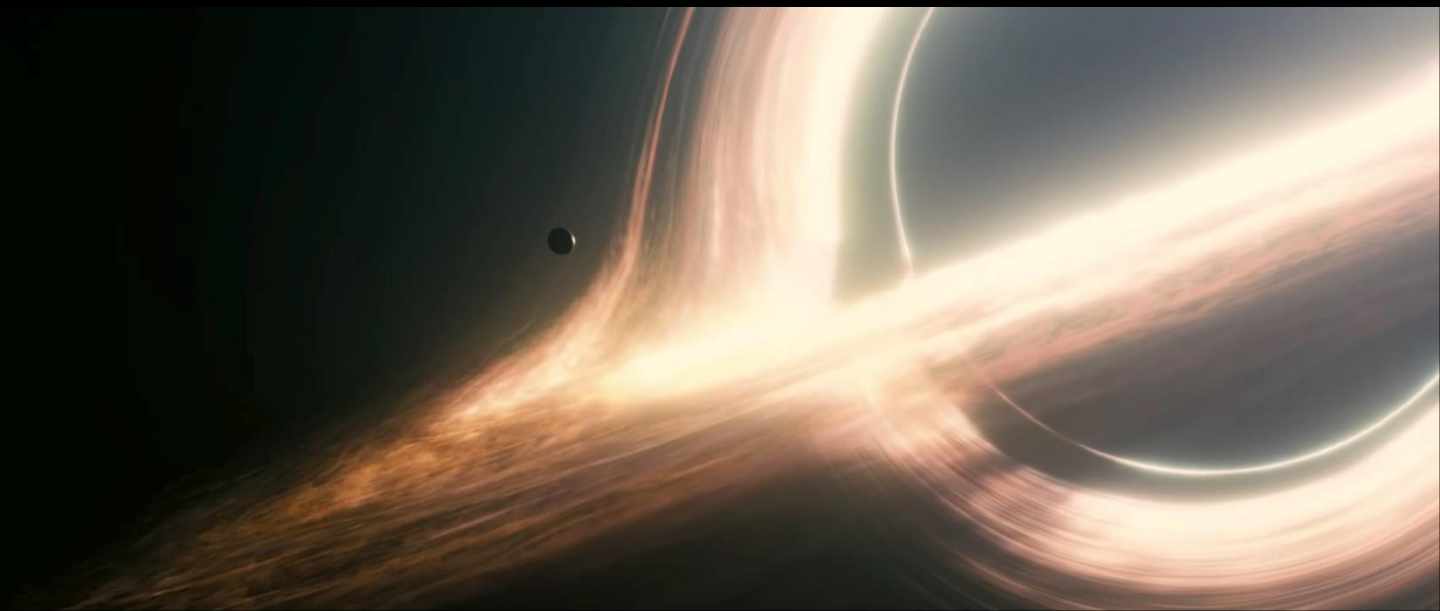
- We “experience” a four dimensional world:
 - Three dimensions in space
 - One dimension in time
- But what’s to say there aren’t other dimensions which we can’t experience
 - String theory says there could be as many as 26!

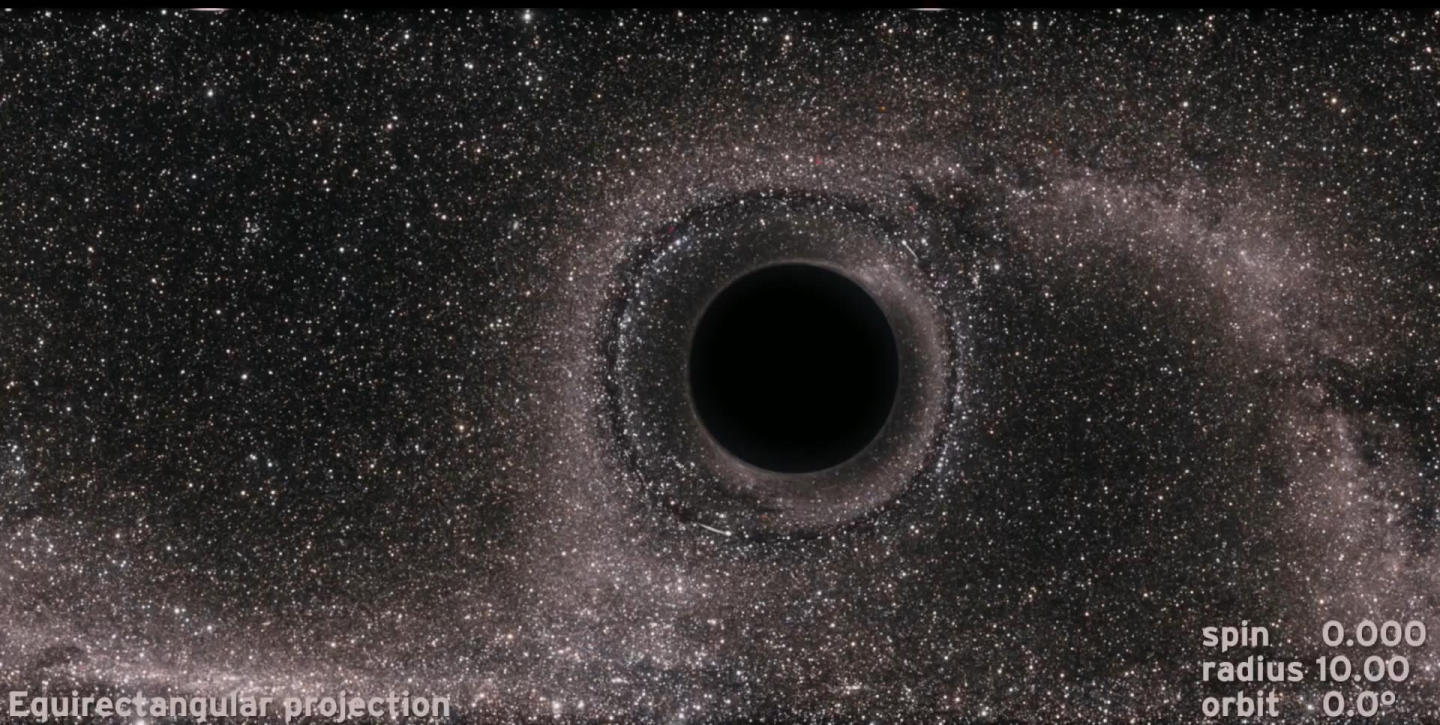
Wormholes & Blackholes



Blackholes







Equirectangular projection

spin 0.000
radius 10.00
orbit 0.0°

Time



GPS



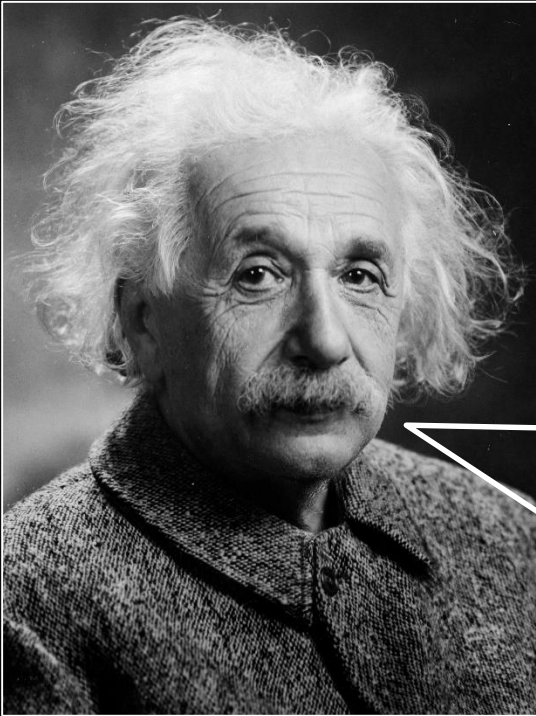
Long Duration Space Travel

- Sending humans anywhere beyond Earth takes a long time
 - You need to slow down the bodies metabolism
 - Reduces the need for food
 - Slows aging
- Therapeutic hypothermia

Mars500



Into a Blackhole...



No information can
escape from a black hole

ABSOLUTELY NONE!

SPOILER ALERT:
This book explains
the fantastic climax
and ending of
Interstellar

THE
SCIENCE
OF
INTERSTELLAR

KIP THORNE

FOREWORD BY CHRISTOPHER NOLAN

