

Movies vs Astronomy

Science fact or science fiction?

Dr Jonathan Crass



THE OHIO STATE
UNIVERSITY



Royal
Astronomical
Society

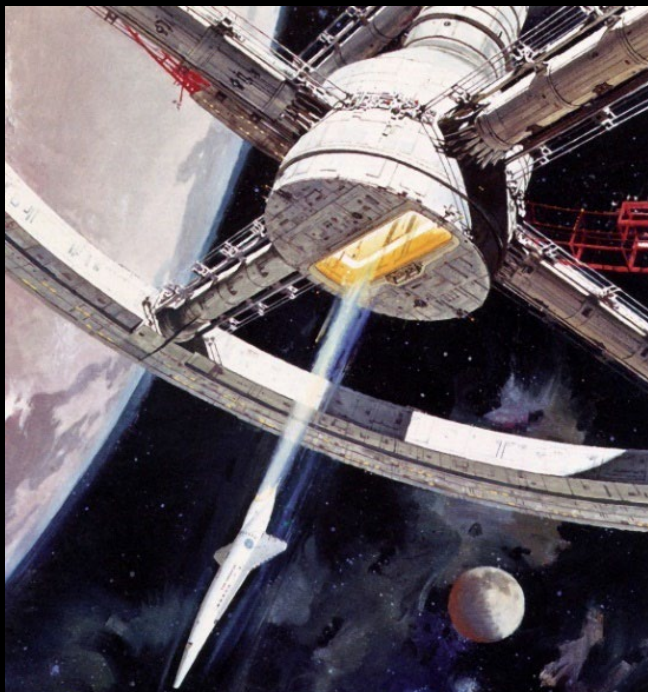
From the Academy Award-Winning Director of "Forrest Gump" and Pulitzer Prize-Winning Author of "Contact."

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. PRESENTS
A MGM FILM
A FILM BY ROBERT ZEMECKIS
JODIE FOSTER MATTHEW MCCONAUGHEY "CONTACT"
JAMES WOODS KYLE CHERT TOM SERRANO ANGELA BASSETT ALAN SIKESTER MICHAEL SCHUBT CLAUDIO VERRINI
JOHN BURGESS CARL SUGHAN IVY DUNN AND IVY BUCKSONE JENNIFER LOST CARL SUGHAN IVY DUNN CARL SUGHAN
JAMES V. HUNT MICHAEL OHLINGER ROBERT ZEMECKIS STEVE STAMER ROBERT ZEMECKIS



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

SUPERPANAVISION®
via METROCOLOR



TOM HANKS KEVIN BACON BILL PAXTON GARY SINISE LD HARRIS

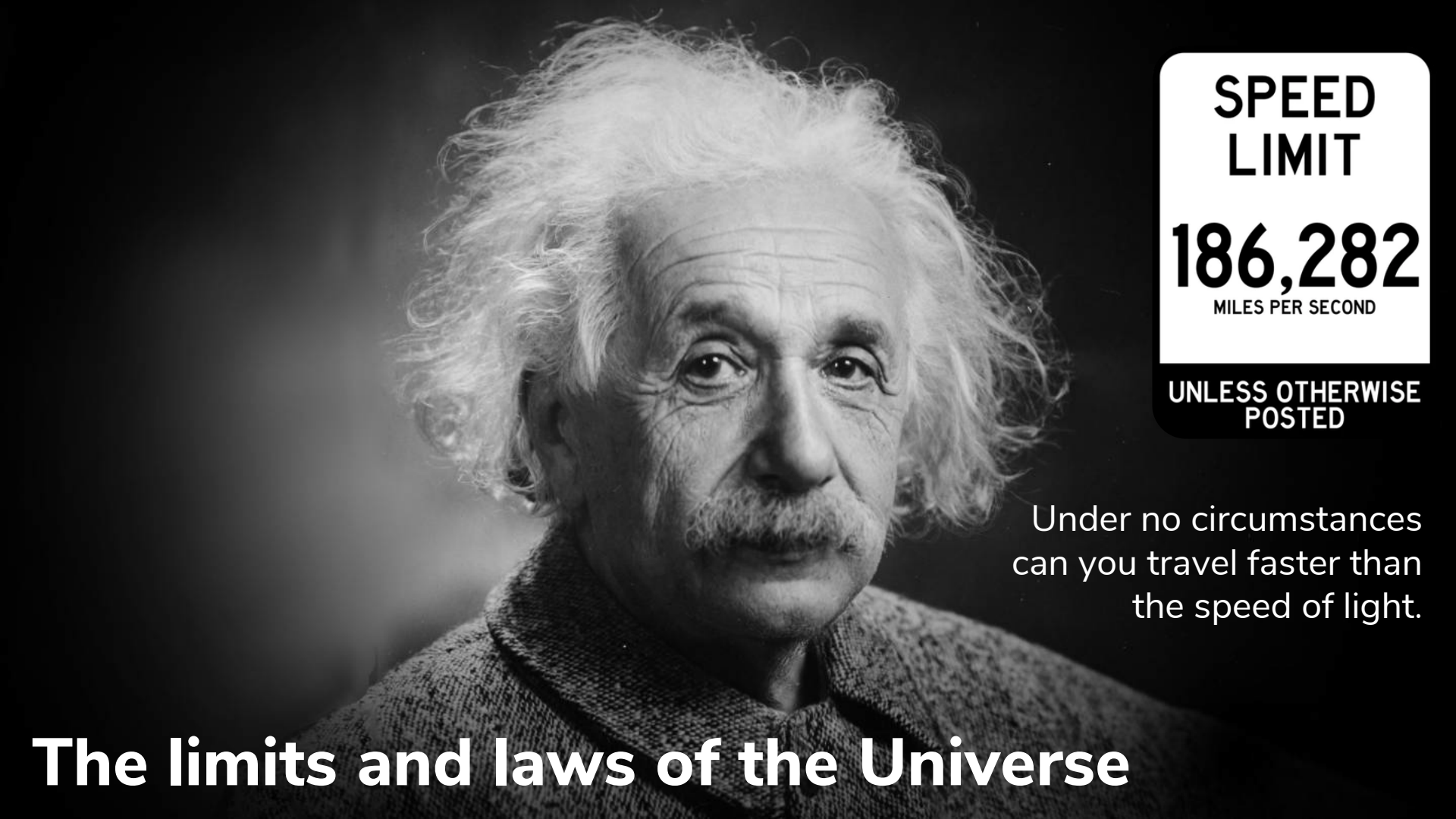


"Houston, we have a problem."

A RON HOWARD FILM

APOLLO 13

IMAGINE ENTERTAINMENT PRESENTS A FILM BY BRIAN GRAZER
"APOLLO 13" KATHLEEN QUINLAN JAMES HOKNER
SARITA INACK ALDRIC LAVALI PORTER MICHAEL BOSTICK
MICHAEL HILL DANIEL HANLEY MICHAEL CORENBLET
DEAN CUNDEY HOOD HALLOWELL JAMES LOVELL JEFFREY KLUGER
WILLIAM BROUDES JR. AL RENZI JOHN SAYLES BRIAN CRAZER
RON HOWARD A UNIVERSAL PICTURE



**SPEED
LIMIT**

186,282
MILES PER SECOND

**UNLESS OTHERWISE
POSTED**

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

The limits and laws of the Universe

A FILM BY SCOTT COOPER
HELP IS ONLY 140 MILLION MILES AWAY



MATT DAMON
THE MARTIAN

INTERMEDIARY CENTURY FILMS PRESENTS A SCOTT COOPER FILM PRODUCED BY SCOTT COOPER AND MATT DAMON "THE MARTIAN" A FILM BY SCOTT COOPER STARRING MATT DAMON JESSICA CHASTAIN KYLE CHANDLER KEVIN SPACEY AND MARK RUFFALO
CASTING BY BEATRICE LEONARDI COSTUME DESIGNER JAMES W. HARRIS EXECUTIVE PRODUCERS JAMES W. HARRIS AND JAMES W. HARRIS PRODUCED BY JAMES W. HARRIS AND JAMES W. HARRIS
WRITTEN BY SIMON SWINBURN AND JOHN COLLIERS DIRECTED BY SCOTT COOPER
CINEMAS SEPTEMBER 30 IN 3D

IN CINEMAS SEPTEMBER 30 IN 3D

#TheMartian



MATTHEW MCCONAUGHEY ANNE HATHAWAY JESSICA CHASTAIN MICHAEL CAINE

EXPERIENCE IT IN **IMAX**



MANKIND'S NEXT STEP WILL BE OUR GREATEST.

A FILM BY CHRISTOPHER NOLAN

INTERSTELLAR

PARAMOUNT PICTURES PRESENTS AN IMAX FILM A FILM BY CHRISTOPHER NOLAN
CASTING BY BEATRICE LEONARDI COSTUME DESIGNER JAMES W. HARRIS EXECUTIVE PRODUCERS JAMES W. HARRIS AND JAMES W. HARRIS PRODUCED BY JAMES W. HARRIS AND JAMES W. HARRIS
WRITTEN BY SIMON SWINBURN AND JOHN COLLIERS DIRECTED BY SCOTT COOPER
CINEMAS SEPTEMBER 30 IN 3D

NOVEMBER 7

SELECT SEQUENCES FILMED WITH IMAX CAMERAS

interstellar.com imax.com

A RIDLEY SCOTT FILM

HELP IS ONLY 140 MILLION MILES AWAY



MATT DAMON

THE MARTIAN

TWENTIETH CENTURY FOX PRESENTS A SCOTT FREE / KINGSTON GEMRE PRODUCTION A RIDLEY SCOTT FILM MATT DAMON "THE MARTIAN" JESSICA CHASTAIN KRISTEN WIG JEFF DANIELS MICHAEL PENN KATE MARA SEAN BEAN SEBASTIAN STAN ANSEL ELWINE AND CHRIVETEL ELIEZER "HARRY GREGSON-WILLIAMS" BOB JANTY VAYES AND PIETRO SCALIA AND "GEOFF ARTHUR" MAX WOODFORD "ANDRZEJ WLODARSKI" AND "SIMON KINDERG" BY RIDLEY SCOTT AND MICHAEL SCHAEFER AND ADITYA SIDDHARTH AND MARK RUFAM AND ANDY WEIR AND BREW BODDARD AND RIDLEY SCOTT

IN CINEMAS SEPTEMBER 30 IN 3D



#TheMartian



A RIDLEY SCOTT FILM

HELP IS ONLY 140 MILLION MILES AWAY



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IN CINEMAS SEPTEMBER 30 IN 3D

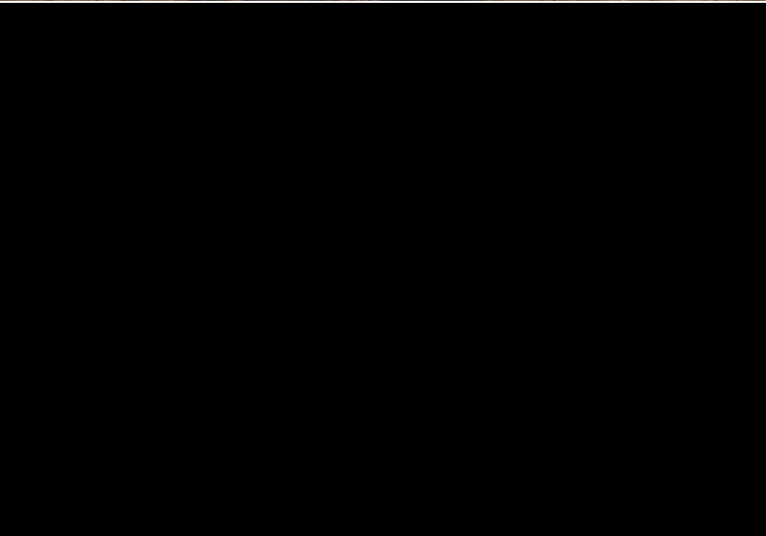
#TheMartian

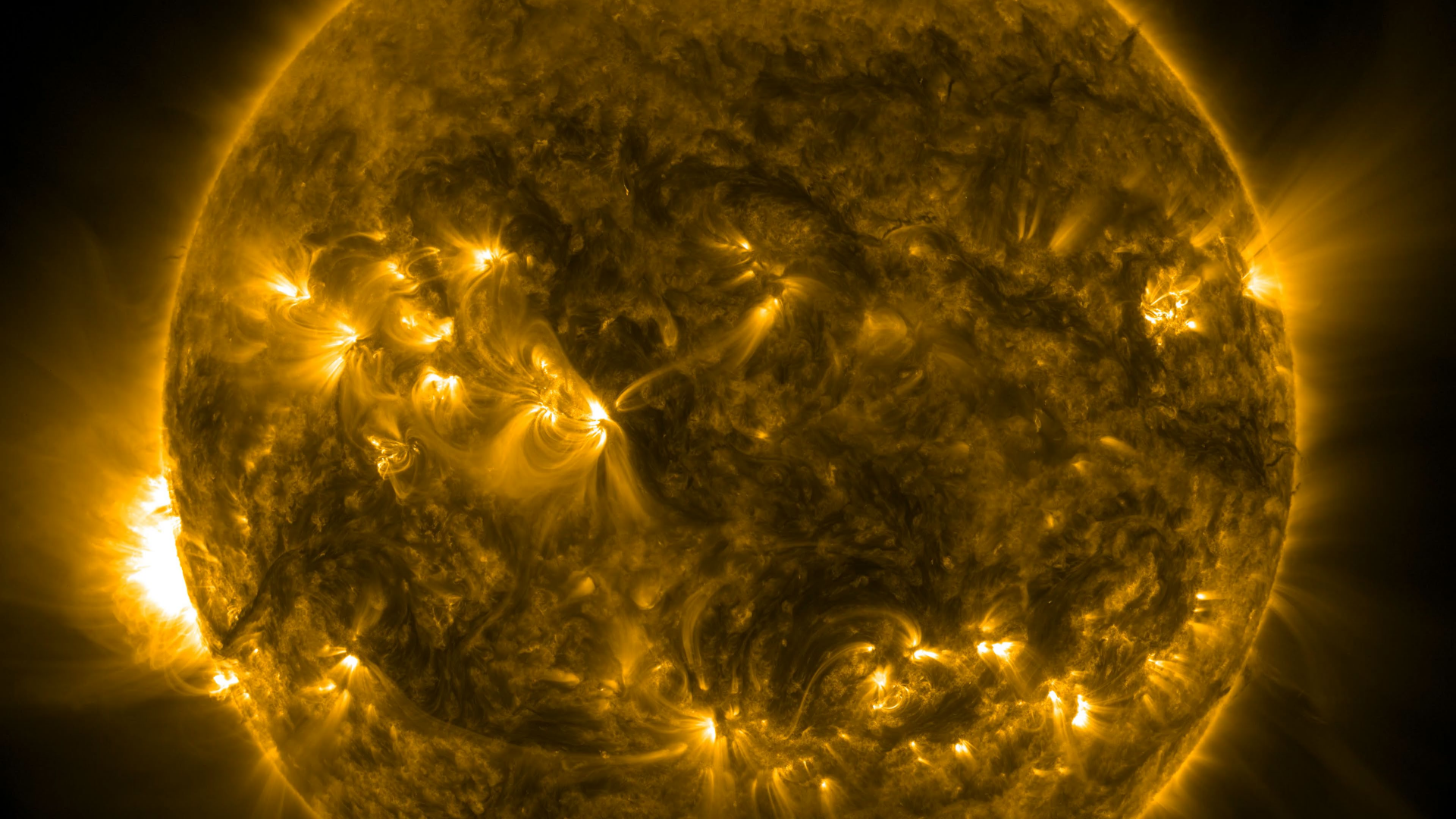




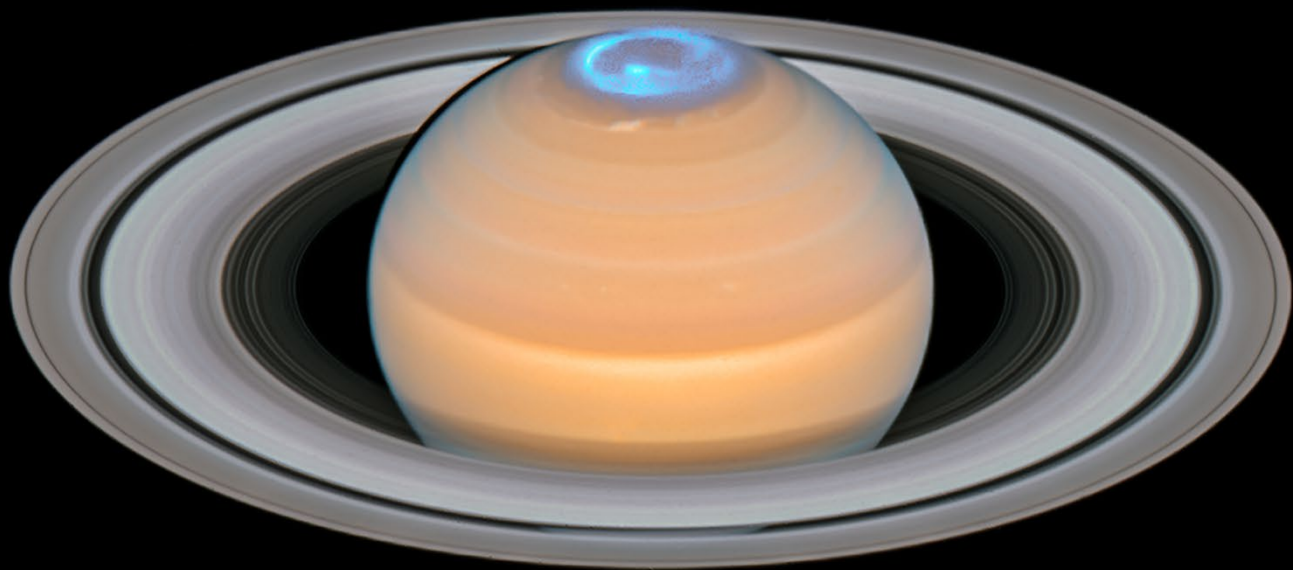


Transport











The Problem of Food

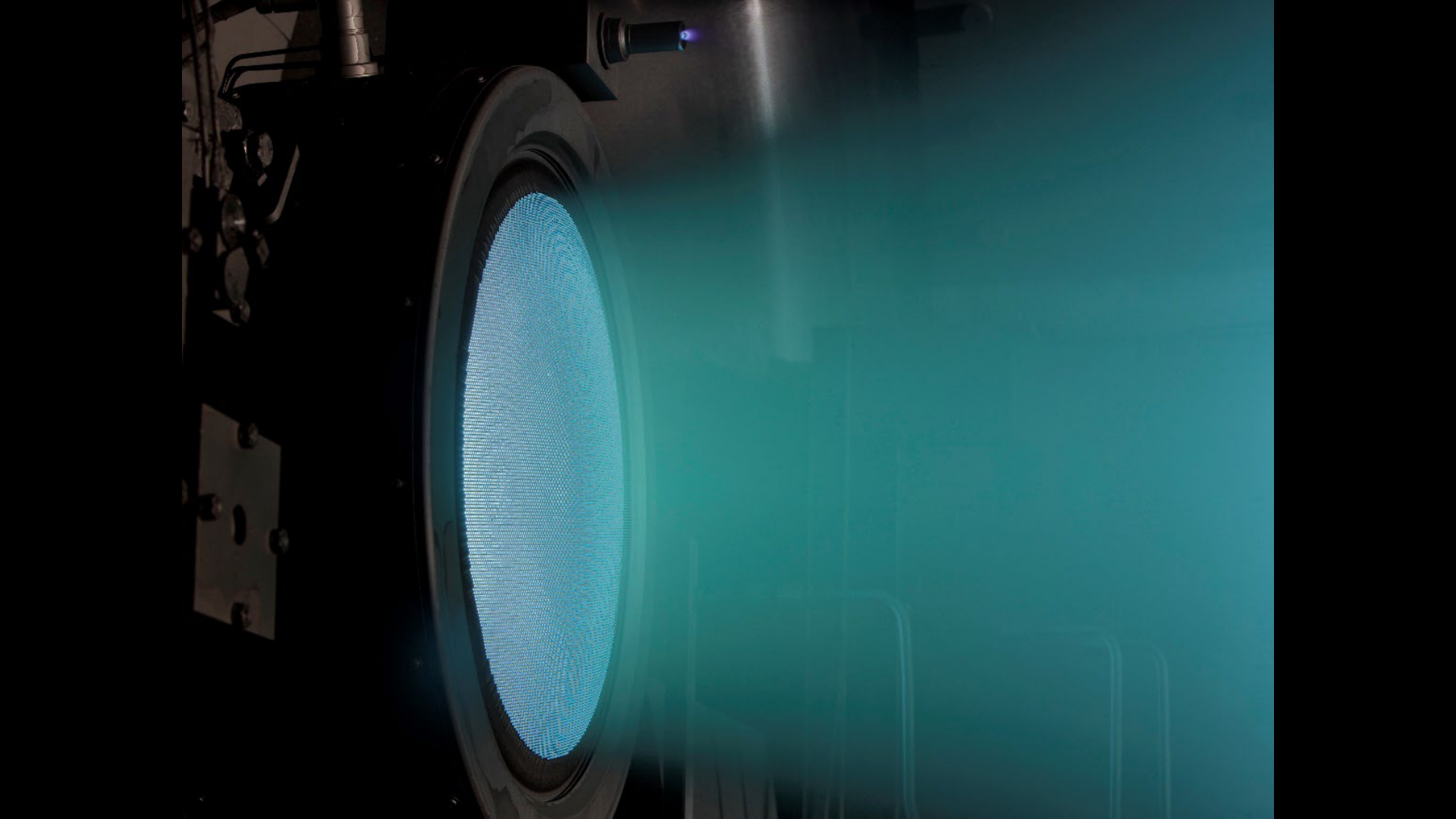




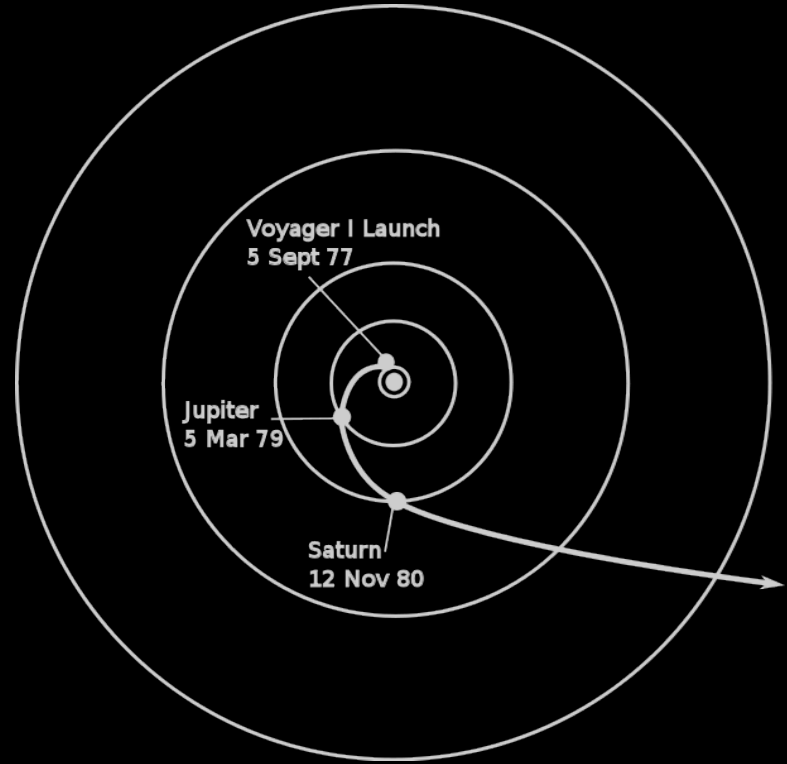
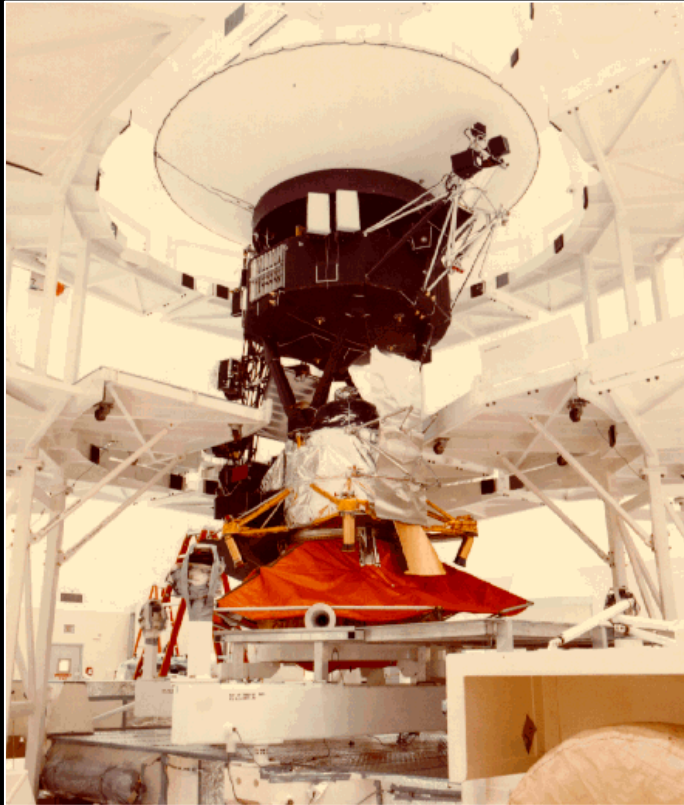
The air to breathe...

The Hermes





Gravity Assists/Flyby









Earth

moon

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 FILM BY CHRISTOPHER NOLAN
A SYNOPTA LINDA OBST PRODUCTIONS PRODUCTION
A FILM BY CHRISTOPHER NOLAN
CASTING BY MATTHEW McCONAUGHEY, ANNE HATHAWAY,
JESSICA CHASTAIN, BILL IRWIN, ELLEN BURSTYN AND MICHAEL CAINE
COSTUME DESIGNER MARY ZUPPES
COSTUME MAKEUP DESIGNER KATHAN CROWLEY
COSTUME MAKEUP ARTIST DON TEXAS ROYTEMA, ESQ.
COSTUME MAKEUP ARTIST JORDAN GOLDBERG
COSTUME MAKEUP ARTIST MIPT HORNE
COSTUME MAKEUP ARTIST JILL
COSTUME MAKEUP ARTIST JONATHAN NOLAN AND CHRISTOPHER NOLAN
COSTUME MAKEUP ARTIST EMMA THOMAS
COSTUME MAKEUP ARTIST CHRISTOPHER NOLAN
COSTUME MAKEUP ARTIST LINDA OBST

IN THEATRES AND IMAX

EVERYWHERE

NOVEMBER 7

interstellarmovie.com interstellar.com

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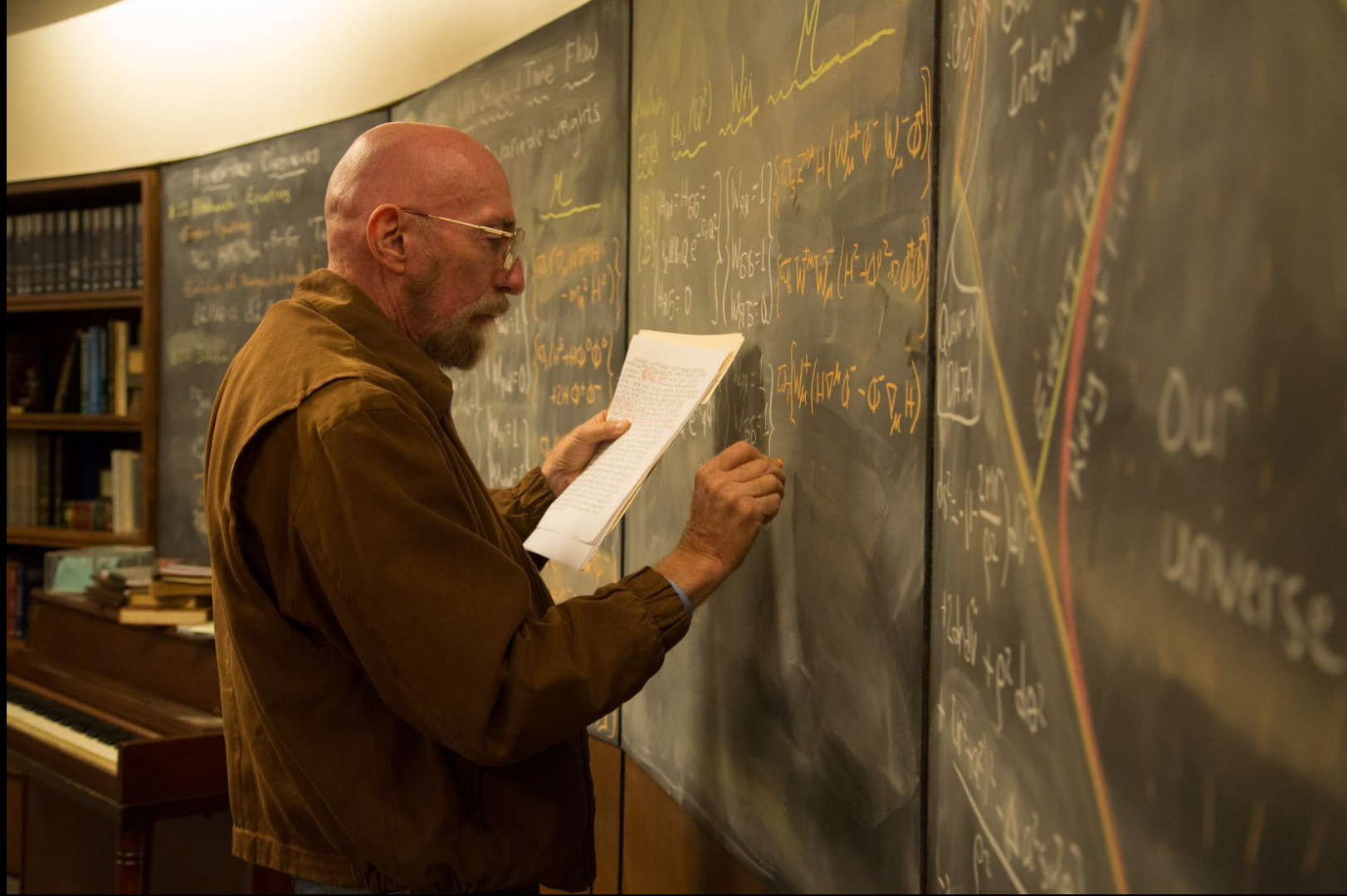
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SCREENPLAY BY JONATHAN NOLAN AND CHRISTOPHER NOLAN
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IN THEATRES AND IMAX

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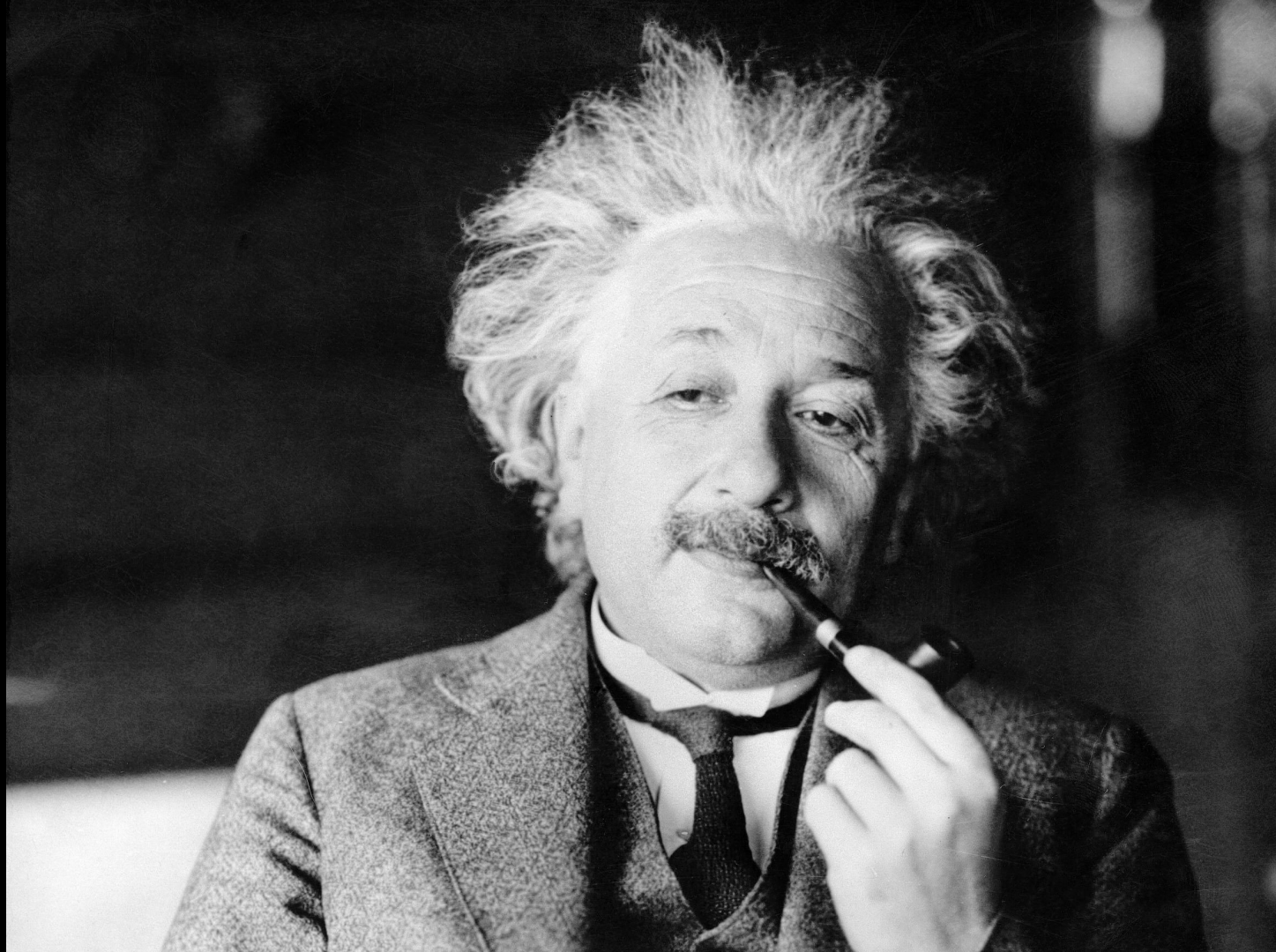


Time Flow
Gravitational Equations
Gravitational Equations
Gravitational Equations

$$W_{ij} = H_{ij} - \frac{1}{2} H^2 g_{ij}$$
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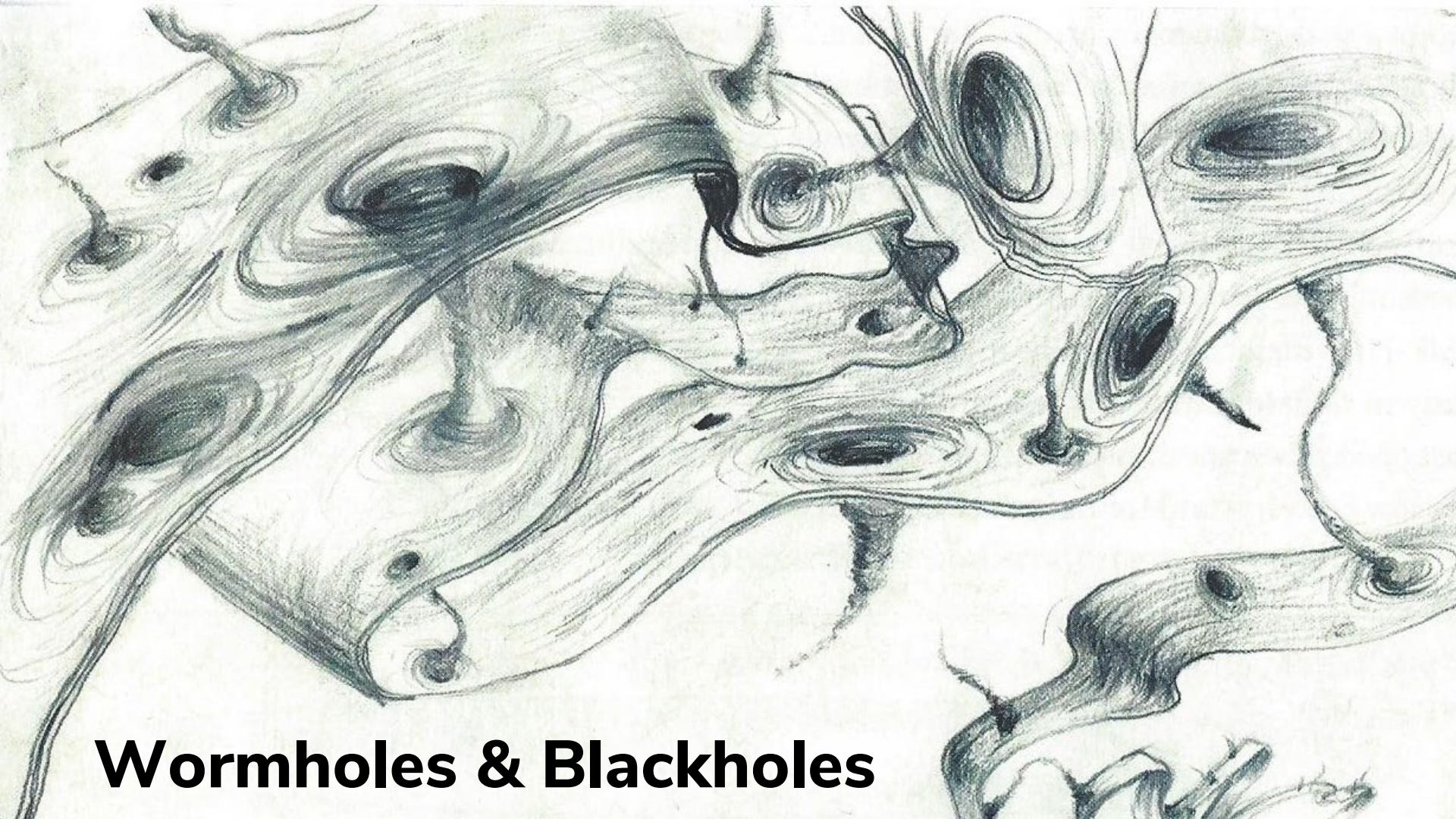
Our Universe
Our Universe
Our Universe



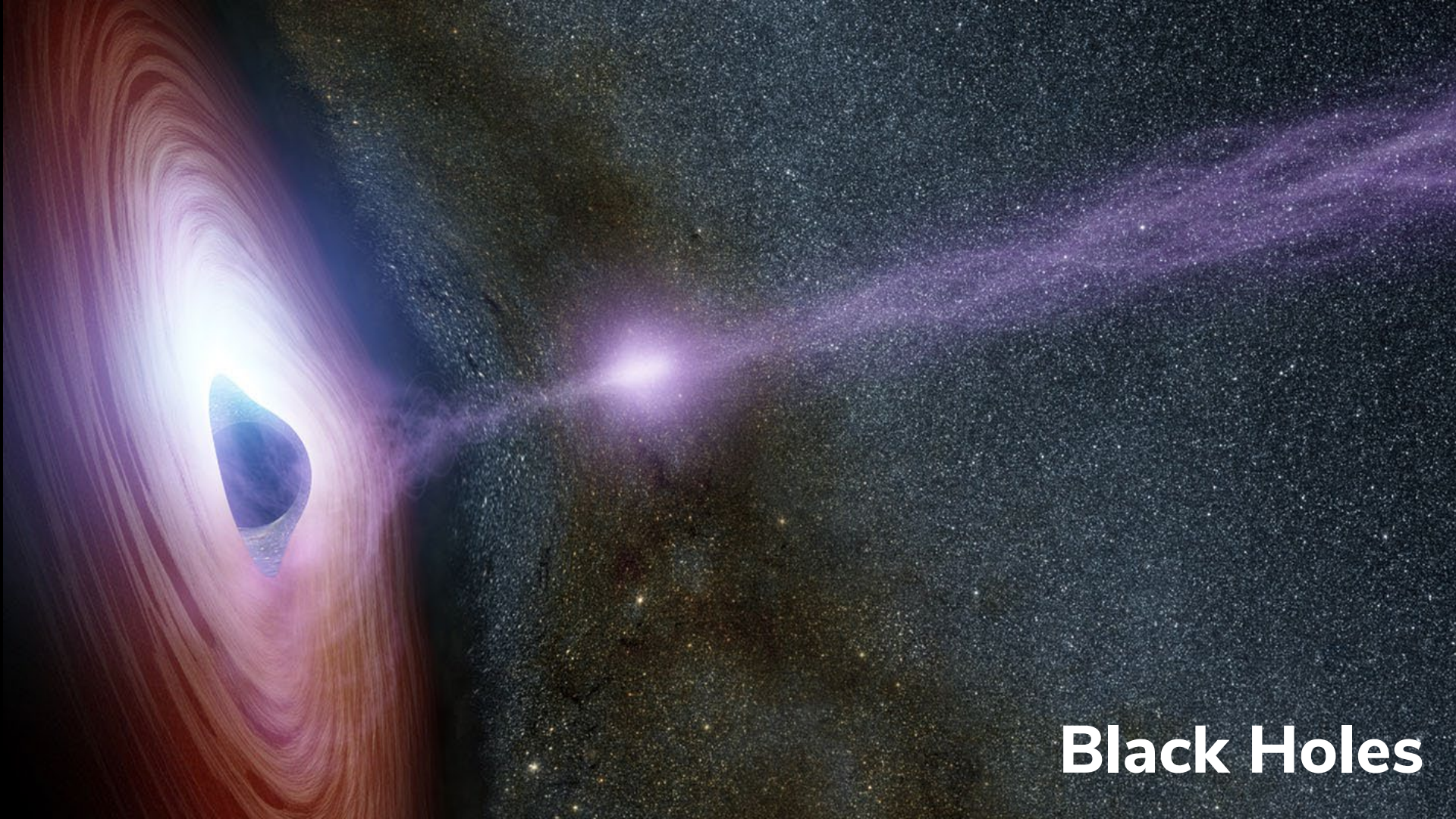


Higher Dimensions

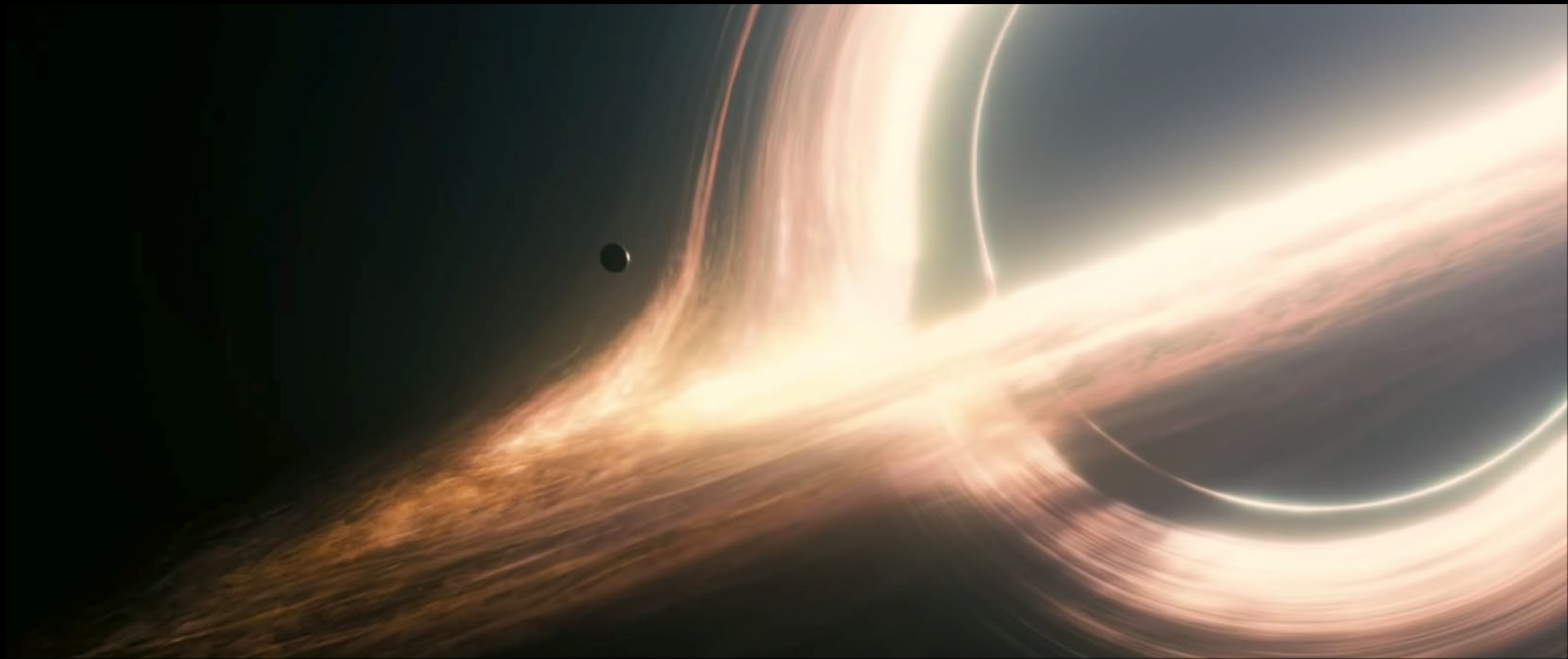
- We “experience” a four dimensional world:
 - Three dimensions in space
 - One dimension in time
- But what’s to say there aren’t other dimensions which we can’t experience
 - String theory says there could be as many as 26!



Wormholes & Blackholes



Black Holes



Event Horizon Telescope (EHT)

A Global Network of Radio Telescopes



2018 Observatories

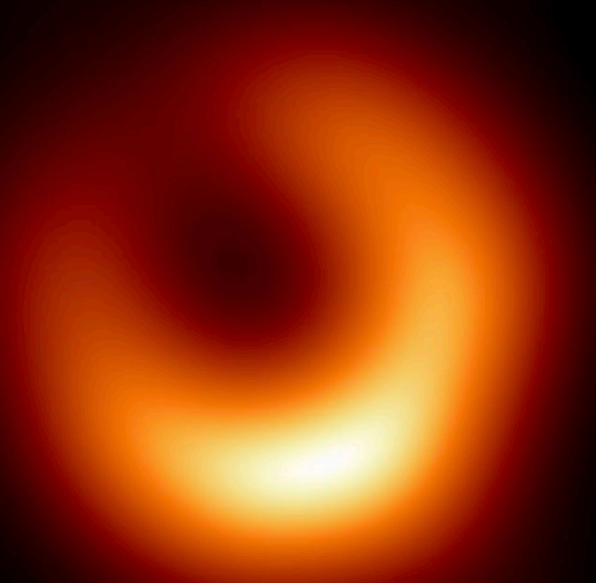
- ALMA**  Atacama Large Millimeter/submillimeter Array
CHAJNANTOR PLATEAU, CHILE
- APEX**  Atacama Pathfinder EXperiment
CHAJNANTOR PLATEAU, CHILE
- 30-M**  IRAM 30-M Telescope
PICO VELETA, SPAIN
- JCMT**  James Clerk Maxwell Telescope
MAUNAKEA, HAWAII
- LMT**  Large Millimeter Telescope
SIERRA NEGRA, MEXICO
- SMA**  Submillimeter Array
MAUNAKEA, HAWAII
- SMT**  Submillimeter Telescope
MOUNT GRAHAM, ARIZONA
- SPT**  South Pole Telescope
SOUTH POLE STATION
- GLT**  The Greenland Telescope
THULE AIR BASE, GREENLAND, DENMARK
- Kitt Peak**  Kitt Peak 12-meter Telescope
KITTE PEAK, ARIZONA, USA
- NOEMA**  NOEMA Observatory
PLATEAU DE BURE, FRANCE

Observing in 2020



2017 April 11

2018 April 21





The effects of time

GPS

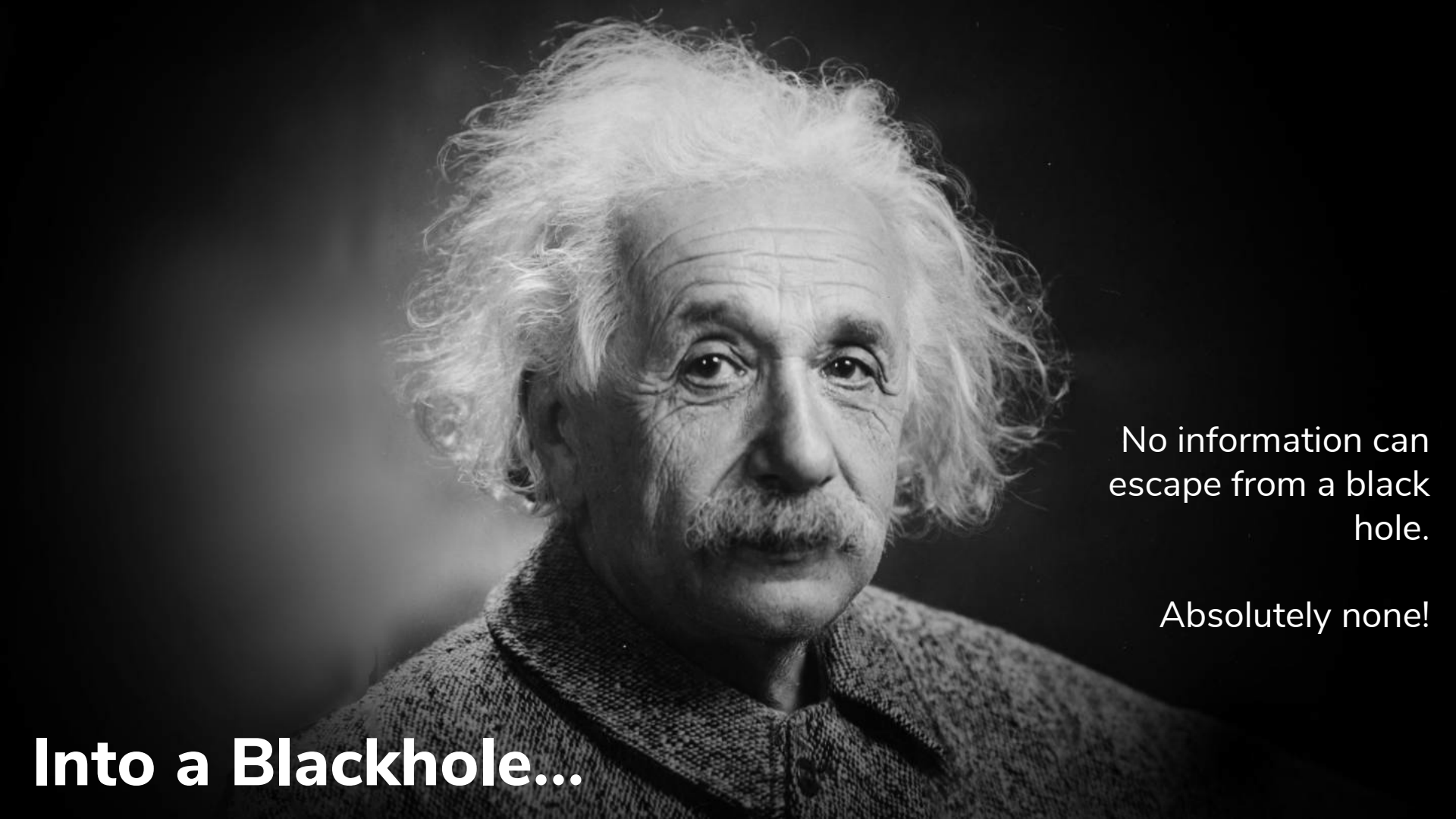


Long Duration Space Travel

- 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





No information can
escape from a black
hole.

Absolutely none!

Into a Blackhole...

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

THE
SCIENCE
OF
INTERSTELLAR

KIP THORNE

FOREWORD BY CHRISTOPHER NOLAN

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IN CINEMAS SEPTEMBER 30 IN 3D

#TheMartian



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EXPERIENCE IT IN IMAX



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NOVEMBER 7

SELECT SEQUENCES FILMED WITH IMAX CAMERAS

www.paramount.com/interstellar



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