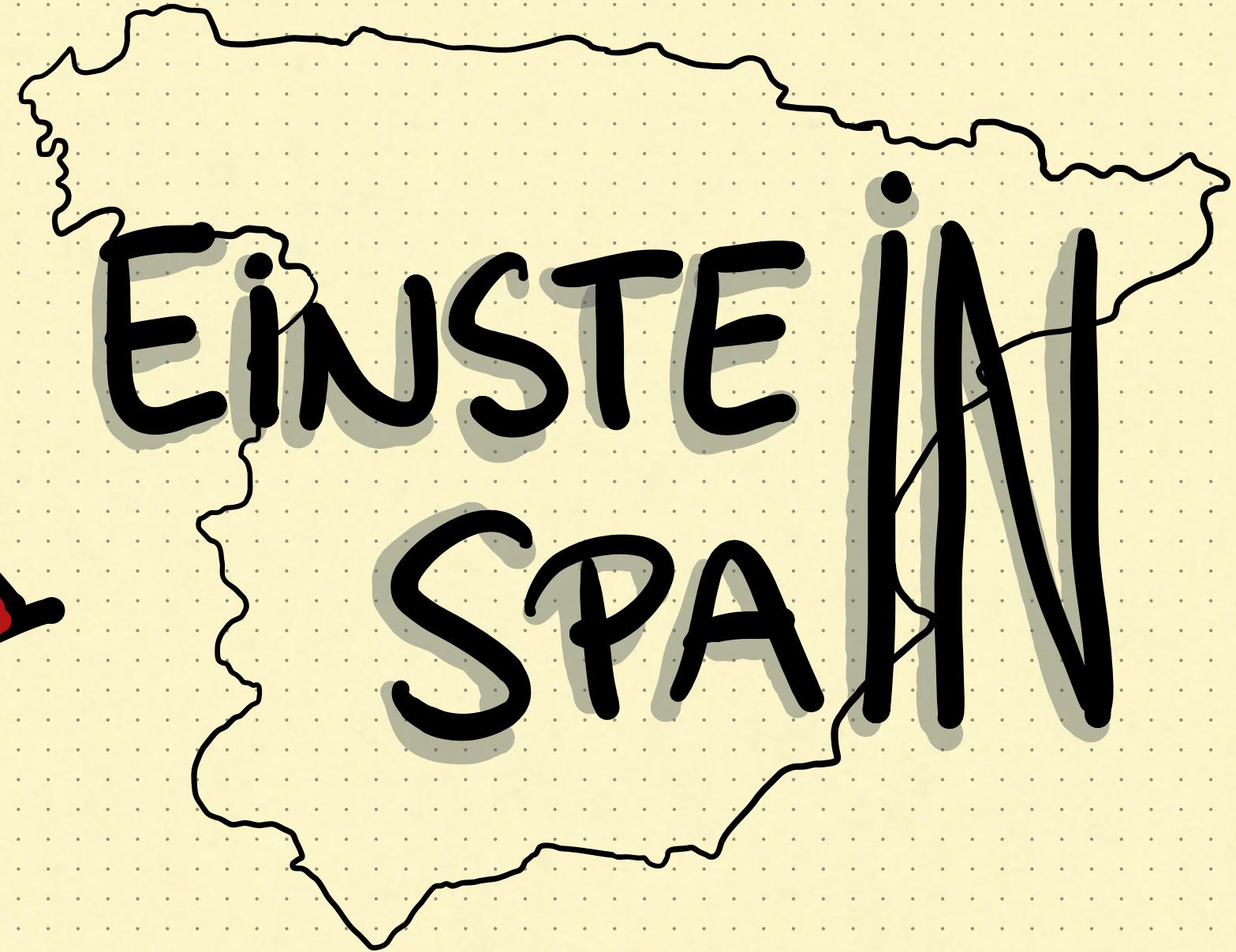


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BIBLIOGRAPHY

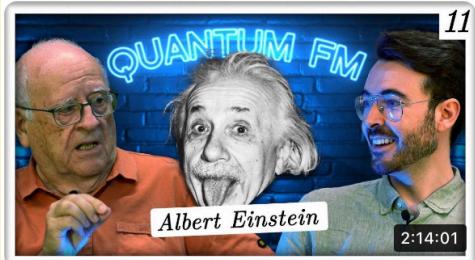


Review

Einstein, Barcelona, Symmetry & Cosmology: The Birth of an Equation for the Universe

Emilio Elizalde

Institute of Space Sciences (ICE/CSIC and IEEC), Campus UAB, Carrer de Can Magrans, s/n, Bellaterra, 08193 Barcelona, Spain; elizalde@ice.csic.es



Albert Einstein, su Historia y su Ciencia Desconocida | Quantum FM #11
con Luis Navarro Veguillas
QuantumFracture · 257K views · Streamed 2 months ago



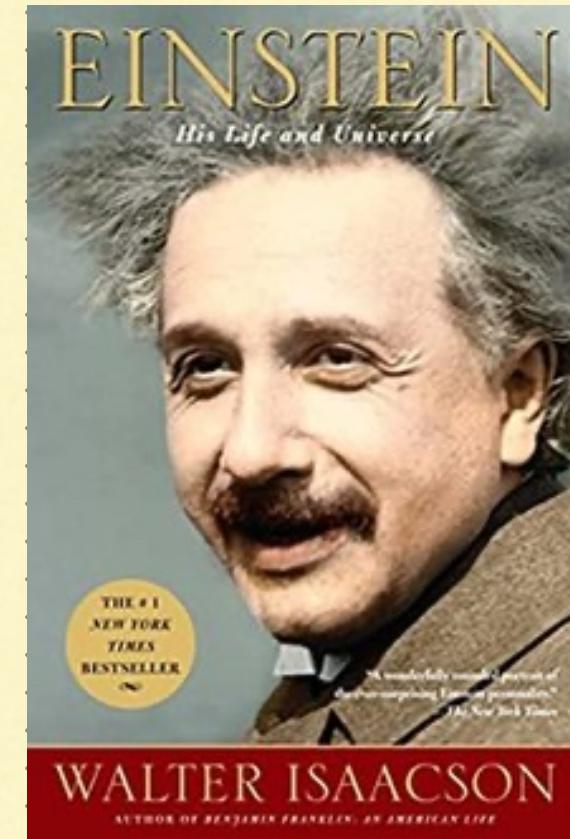
QuantumFracture



La Loca Visita de Einstein a España
QuantumFracture · 336K views · 2 months ago



QuantumFracture



+ REFERENCES THEREIN

SHORT Bio (1879 - 1955)

1905

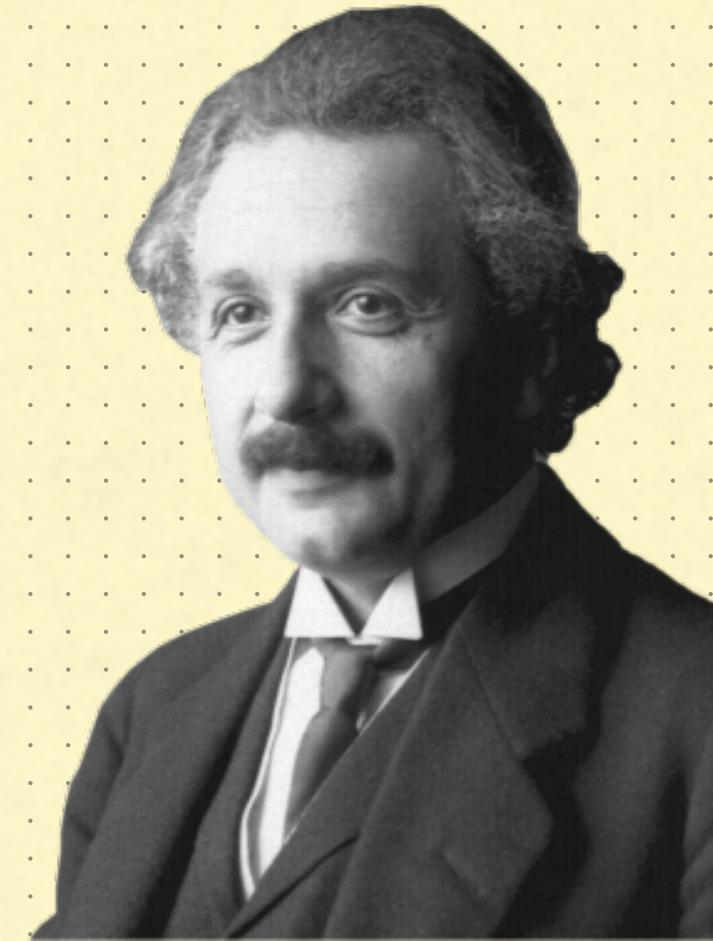
1915

1917

1919

1922

1923



SHORT Bio (1879 - 1955)

1905 ANNUS MIRABILIS : 4 GROUNDBREAKING PAPERS

- PHOTOELECTRIC EFFECT
- BROWNIAN MOTION
- SPECIAL RELATIVITY
- $E = mc^2$

1915

1917

1919

1922

1923



SHORT Bio (1879 - 1955)

1905 ANNUS MIRABILIS : 4 GROUNDBREAKING PAPERS

→ PHOTOELECTRIC EFFECT
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→ $E = mc^2$

1915 THEORY OF GENERAL RELATIVITY

1917

1919

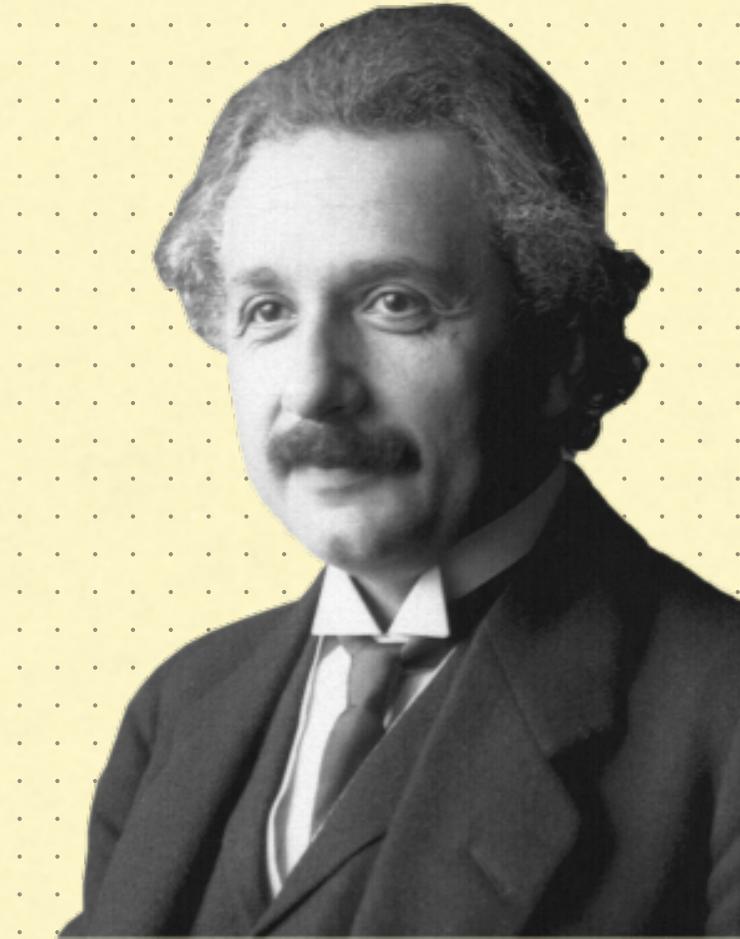
1922

1923



SHORT Bio (1879 - 1955)

- 1905 ANNUS MIRABILIS : 4 GROUNDBREAKING PAPERS
- PHOTOELECTRIC EFFECT
 - BROWNIAN MOTION
 - SPECIAL RELATIVITY
 - $E = mc^2$
- 1915 THEORY OF GENERAL RELATIVITY
- 1917 GR FIRST APPLIED TO UNIVERSE (INTRODUCTION OF Λ TO MAKE UNIVERSE STATIC)
- 1919
- 1922
- 1923



SHORT Bio (1879 - 1955)

1905 ANNUS MIRABILIS : 4 GROUNDBREAKING PAPERS

PHOTOELECTRIC EFFECT
BROWNIAN MOTION
SPECIAL RELATIVITY
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1919 SOLAR ECLIPSE PROVES GR (EDDINGTON) → WORLD FAME

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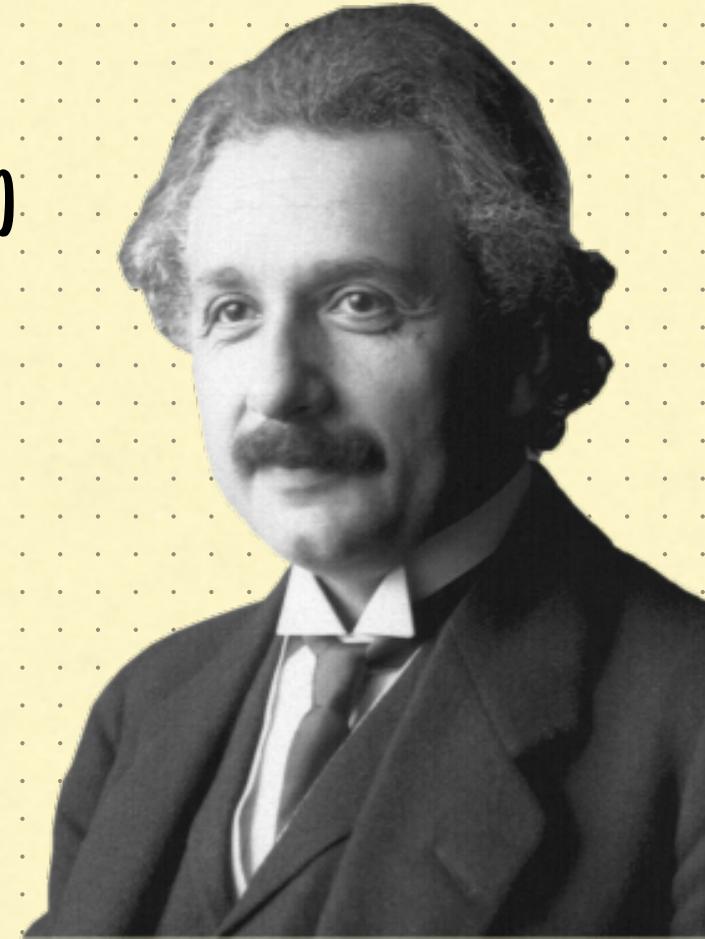
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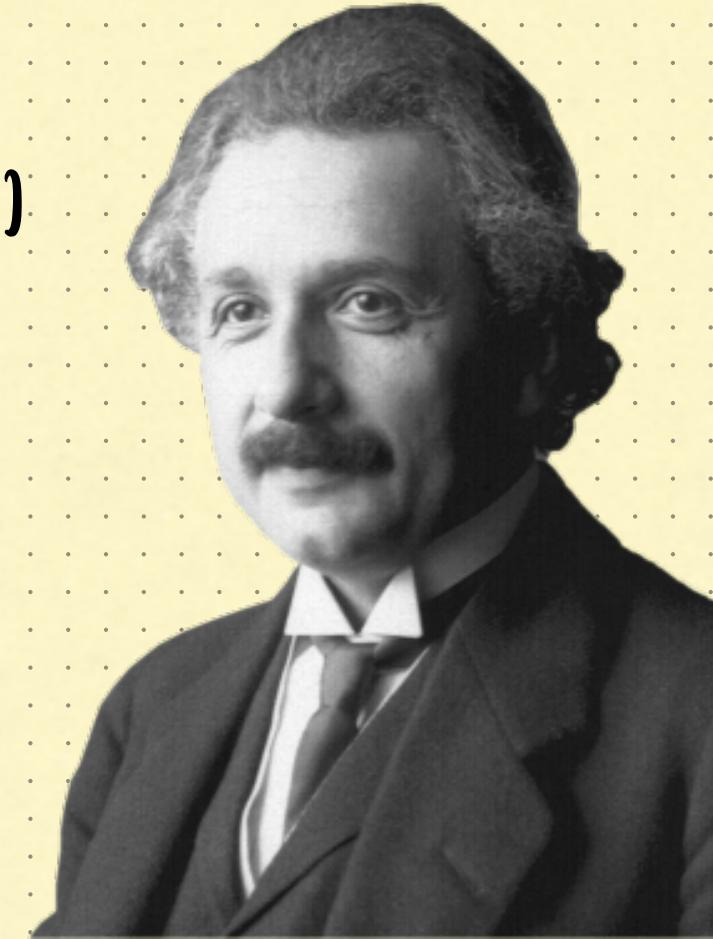
PHOTOELECTRIC EFFECT
BROWNIAN MOTION
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- 1922 NOBEL PRIZE FOR PHOTOELECTRIC EFFECT (CONTROVERSY)
- 1923 VISIT TO SPAIN

PHOTOELECTRIC EFFECT
BROWNIAN MOTION
SPECIAL RELATIVITY
 $E = mc^2$



HISTORICAL CONTEXT 1923

- 1ST FLIGHT ON AUTOGLIRO (JUAN DE LA CIERVA)
- TROOPS FROM FRANCE & BELGIUM OCCUPY RUHR REGION TO FORCE GERMANY TO PAY WAR REPARATIONS AGREED IN VERSAILLES
- HYPERINFLATION IN GERMANY :
 - EARLY 1922 : 1 \$ = 160 MARKS
 - NOV 1923 : 1 \$ = 4,200,000,000,000 MARKS
- TUTANKHAMUN'S TOMB DISCOVERED
- JEWISH DIPLOMAT AND PHILOSOPHER WALTER RATHENAU MURDERED IN BERLIN BY GERMAN NATIONALISTS
- ANARCHIST SALVADOR SEGÚ MURDERED IN BARCELONA
- COUP D'ÉTAT IN SPAIN LED BY GENERAL PRIMO DE RIVERA
 - SUSPENDED GOVERNMENT
 - PARLIAMENT DISSOLVED
 - ESTABLISHED DICTATORSHIP
- FAILED COUP D'ÉTAT IN MUNICH (HITLER & RUDOLF HESS SENTENCED TO PRISON)

EINSTEIN'S 6-MONTH TOUR

- 1923 , 43 YEARS OLD
- WITH WIFE ELSA EINSTEIN



EINSTEIN'S 6-MONTH TOUR

- 1923, 43 YEARS OLD
- WITH WIFE ELSA EINSTEIN



WHY?

- TOURISM
- MAKE HIMSELF KNOWN
- GET AWAY FROM DANGEROUS BERLIN
- MONEY

EINSTEIN'S 6-MONTH TOUR

- 1923, 43 YEARS OLD
- WITH WIFE ELSA EINSTEIN



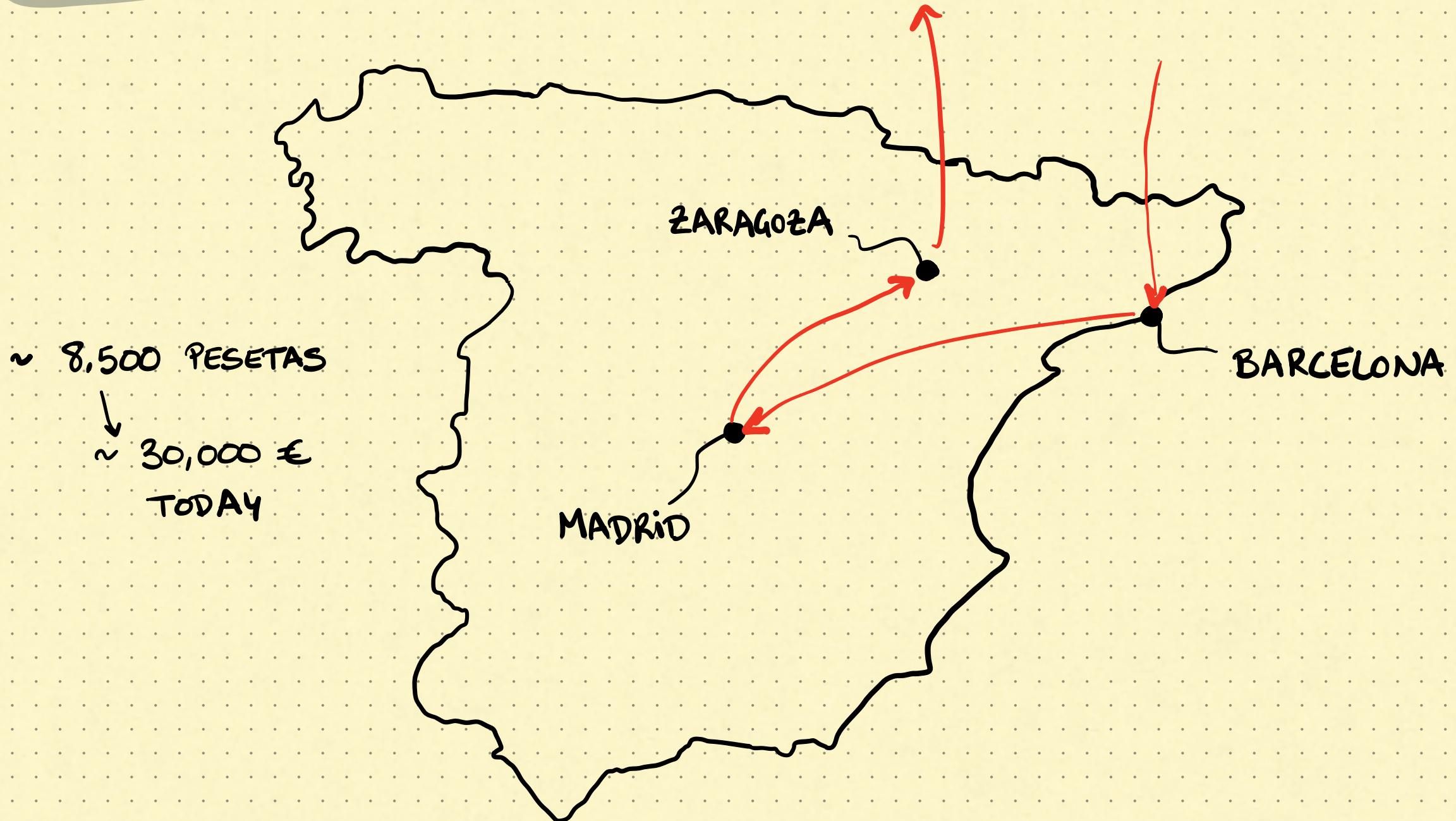
WHY?

- TOURISM
- MAKE HIMSELF KNOWN
- GET AWAY FROM DANGEROUS BERLIN
- MONEY

(E.G. £2,000 FOR 15 LECTURES IN JAPAN, ~£150,000 TODAY!)

EINSTEIN IN SPAIN

3 WEEKS



BARCELONA (22 - 28 FEB)

- INITIATED BY ESTEVE FERRADES (PHYSICIST)

ACC. TO EINSTEIN:

"ONE OF THE BEST 6 BRAINS IN THE WORLD"

DESIGNER OF LINE 1 OF BARCELONA'S METRO

- CONFUSION AT TRAIN STATION

HOSTAL 4 NACIONES → HOTEL COLON (~700 PESETAS)

- TALKS ON
 - SPECIAL RELATIVITY
 - GENERAL RELATIVITY
 - LATEST DEVELOPMENTS

TICKET 25 PESETAS, ~125 € TODAY
(ALWAYS FULL!)



ESPUGA DE FRANCOLÍ, 25 FEB

BARCELONA (22 - 28 FEB)

- EINSTEIN'S DIARY : 3 LINES FOR CATALONIA VISIT
VS
+40 LINES REST OF THE TRIP

HOWEVER, LEFT SEVERAL BLANK PAGES AFTER CATALONIA ENTRY

↳ MAYBE INTENDED TO FILL UP LATER ?

22–28 February. Stop in Barcelona. We are tired but friendly people (Terradas, Campalans, Lana, Tirpitz's daughter). Popular songs, dances. Refectory. How beautiful it was! (Figure 13)



ESCOLA INDUSTRIAL, BARCELONA (SARDANAS)
25 FEB

BARCELONA (22 - 28 FEB)

- HONORARY THEMATIC DINNER PARTY BY RAFAEL CAMPALANS

MENU:

Scientia a priori

ꝝ Solida ꝝ

Cannulae Flizeauensis

Penael Caramote et Mollusci Baussen-
sis cum jure Wagonensi in perihelio

Fabae Laurentziana catalaunice
transformate

Phasianus nycthemerus Winskowskien-
sis, quadruplex dimentiones

Ibomo Platonicus secundum Diogenem
cum jure Michelsonense

Continuos Euclidianus glaciatus

Encasadae furni Sancti Jacobi et
Saccharea edulis Weylensis, simultanea
Fructus Galilei

ꝝ Liquida ꝝ

Castrum Remedii gravitatorium

Xeres Chil Josephi Inertialis

Malum parvum cum Doppler effectu

Xampanus relativisticus Codornuensis
deflectens lucem

Caffea sobriensis cum spirituosisbus
liquoribus et vectoribus tabacalibus

ꝝ Tempus locale :

II Kalendas Martii, Anno XLIV
Erae Einsteiniane

ꝝ Locus :

Bedibus Campalani, studiosi catalaunici
Barcinoensis

IN LATIN WITH RELATIVISTIC REFERENCES

BARCELONA (22 - 28 FEB)

- HONORARY THEMATIC DINNER PARTY BY RAFAEL CAMPALANS

MENU:

HIPPOLYTE
FIZEAU

4-DIM MINKOWSKI

CHICKEN

ALBERT
MICHELSON

et Solida
Cannulae Fizeauensis
*Penaei Caramote et Mollusci Baussen-
sis cum jure Wagonensi in perihelio*
*Fabae Laurentziana catalaunice
transformate*
*Phasianus nocthemerus Winskowskien-
sis, quadruplex dimentiones*
*Iomo Platonicus secundum Diogenem
cum jure Michelsonense*
Continuos Euclidianus glaciatus
*Encasadae furni Sancti Jacobi et
Saccharea edulis Weylensia, simultanea*
Fructus Galilei

et Liquida
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Xeres Chil Josephi Inertialis
Malum parvum cum Doppler effectu
*Xampanus relativisticus Codornuensis
deflectens lucem*
*Caffea sobraliensis cum spirituosisbus
liquoribus et vectoribus tabacalibus*

T Tempus locale :
II Kalendas Martii, Anno XLIV
Erae Einsteiniane
T Locus :
*Bedibus Campalani, studiosi catalaunici
Barcinoensis*

JEREZ
"EL TIO PEPE"

COFFEE FROM
BRASIL (SOBRAL)
WHERE 1919
SOLAR ECLIPSE

BARCELONA (22 - 28 FEB)

Politics:

- EINSTEIN WAS A DECLARED PACIFIST
- CAMPALANS WAS A SOCIALIST CATALANIST
 - ↳ FACILITATED INTERVIEW WITH ÁNGEL PESTAÑA
(CNT PRESIDENT)
 - CONFÉDÉRATION OF
ANARCHO-SYNDICALIST
LABOR UNIONS
 - NO DIRECT REFERENCES
 - ↳ SEEMS LIKE EINSTEIN:
 - ENCOURAGED THEIR REINVENTIVE WORK
 - BUT CAPITALISM IS NOT THAT BAD
- AFTER, PESTAÑA CLAIMED THAT EINSTEIN WAS A REVOLUTIONARY
(A BIT MADE UP)
- BUT EINSTEIN WAS SUPPOSED TO MEET THE KING IN MADRID!
- SO HE ACCEPTED A PRESS INTERVIEW ON THE TRAIN TO MADRID
TO FALSIFY THIS CLAIM (HE WAS "ASSAULTED" BY A JOURNALIST ON THE TRAIN)
 - ↳ SAID HE WASN'T A REVOLUTIONARY AND HAD NO FAITH IN SOCIALISM



ESTACIÓ DE FRÀGUA,
BARCELONA
1 MARCH

MADRID (1-12 MARCH)

- INVITED BY JULIO REY PASTOR (MATHEMATICIAN)
- RECEIVED HONORS FROM KING ALFONSO XIII
- NAMED MEMBER OF "REAL ACADEMIA DE CIENCIAS"
AND DOCTOR HONORIS CAUSA BY "UNIVERSIDAD CENTRAL"
- VISITED 3 TIMES EL PRADO
- VISITED SANTIAGO RAMÓN Y CASAL (NOBEL PRIZE)
- FASCINATED BY TOLEDO
 - ↳ WENT WITH ORTEGA Y GASSET (PHILOSOPHER, NOMINATED TO NOBEL PRIZE)

MADRID (1-12 MARCH)

1 March Arrival in Madrid. Departure from Barcelona, farewell. Terradas, German consul with Tirpitz's daughter, etc. (Figure 14)

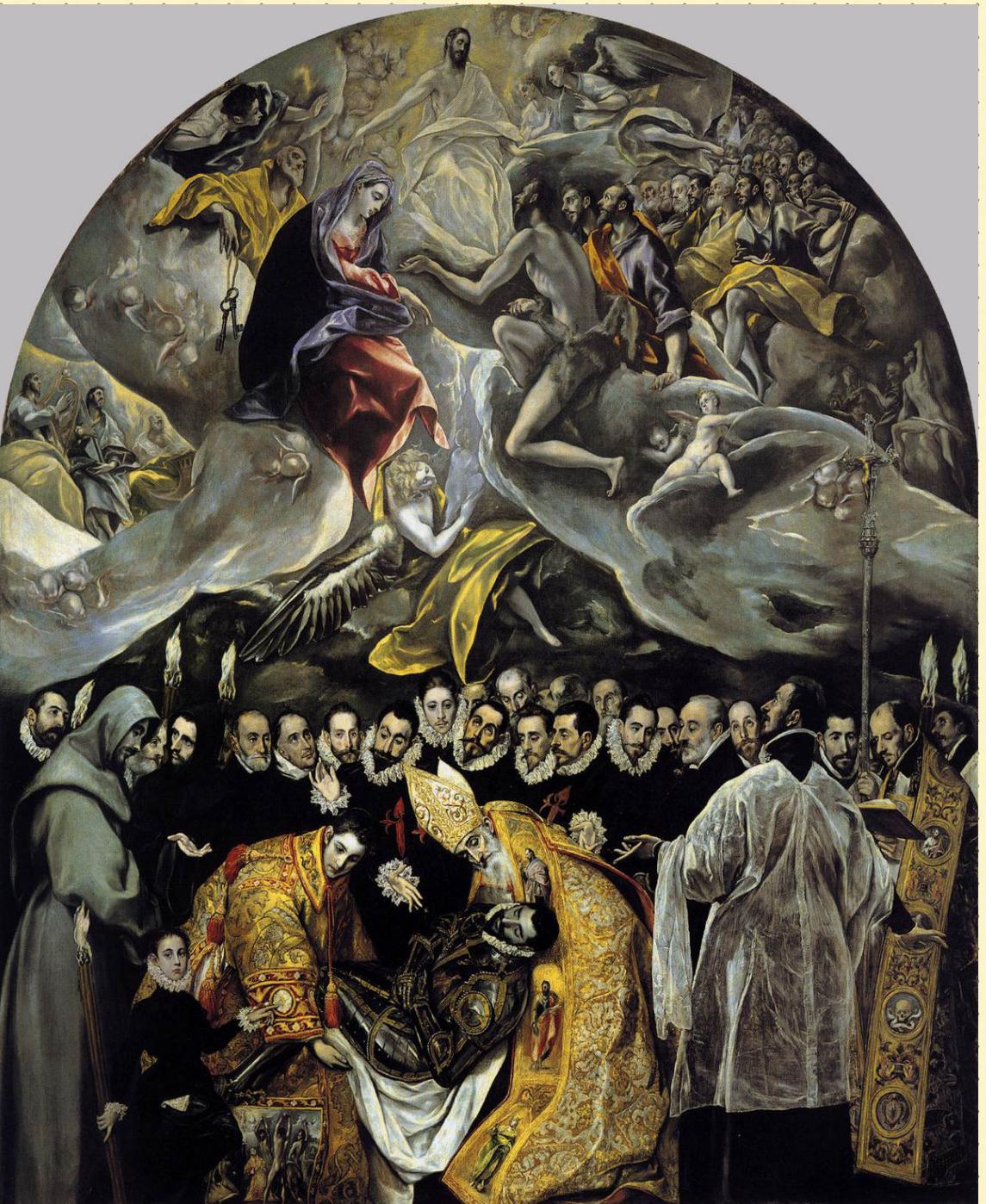
3 March First lecture at the university.

4 March Car ride with Kocherthaler—answer to Cabrera. I wrote the academy speech. Academy session in the afternoon chaired by the king. Magnificent speech by the president of the acad. Afterwards, tea in the society of artists. Ladies. You felt at home but in a very Catholic atmosphere.

"CAJAL..."

5th In the morning. Honorary member of the Mathematical Society. Debate on general relativity. Lunch at Kuno's. Visit with Kuchal. A wonderful old thinker. Very sick, good conversation. Invitation to dinner in the afternoon from Mr. Vogel. He has a good heart, humorous pessimism.

6th Excursion to Toledo hidden through many lies. One of the best days of my life. Radiant skies Toledo is like a fairy tale. We were guided by an old enthusiast, who supposedly had written something important about Gra [El Greco]. Streets and market, city views, the Tagus with stone bridges, stone covered hills, lovely level cathedral, synagogue, sunset on the return trip with brilliant colors. Small gardens with views near the synagogue. Greco's magnificent fresco in a small church (burial of a nobleman) is one of the most profound images I have ever seen. Wonderful day.



THE BURIAL BY THE COUNT OF ORGAZ , EL GRECO

MADRID (1-12 MARCH)

7th Audience at noon with the King and Queen Mother. The latter shows that she knows about science. You realize that no one tells her what they think. The king, simple and dignified, I admire him for his ways. In the afternoon, the third university conference, a devoted audience that probably couldn't understand practically anything because the latest problems were being discussed. In the evening, a great reception at the home of the German envoy. The envoy and family are magnificent and modest people. Socializing is as heavy as ever.

8th Honorary doctorate. Spanish speeches with associated firecrackers. Long but with good content that of the envoy on German-Spanish relations but in genuine German. No rhetoric. Then, in the afternoon, visit with the technical students. Speeches and nothing more than speeches, but very meaningful. Talk in the evening. Then playing music at Kuno's. A professional (director of the conservatory), Poras [Bordás] played the violin exquisitely.

9th Excursion to the mountain and El Escorial. Glorious day. An evening reception in the student residence with talks by Ortega and me.

10th Prado (mainly looking at paintings by Velazquez and El Greco). Farewell visits. Lunch at the home of the German envoy. A night with Lina and the Ullmanns in a small and primitive dance venue. Fun evening.

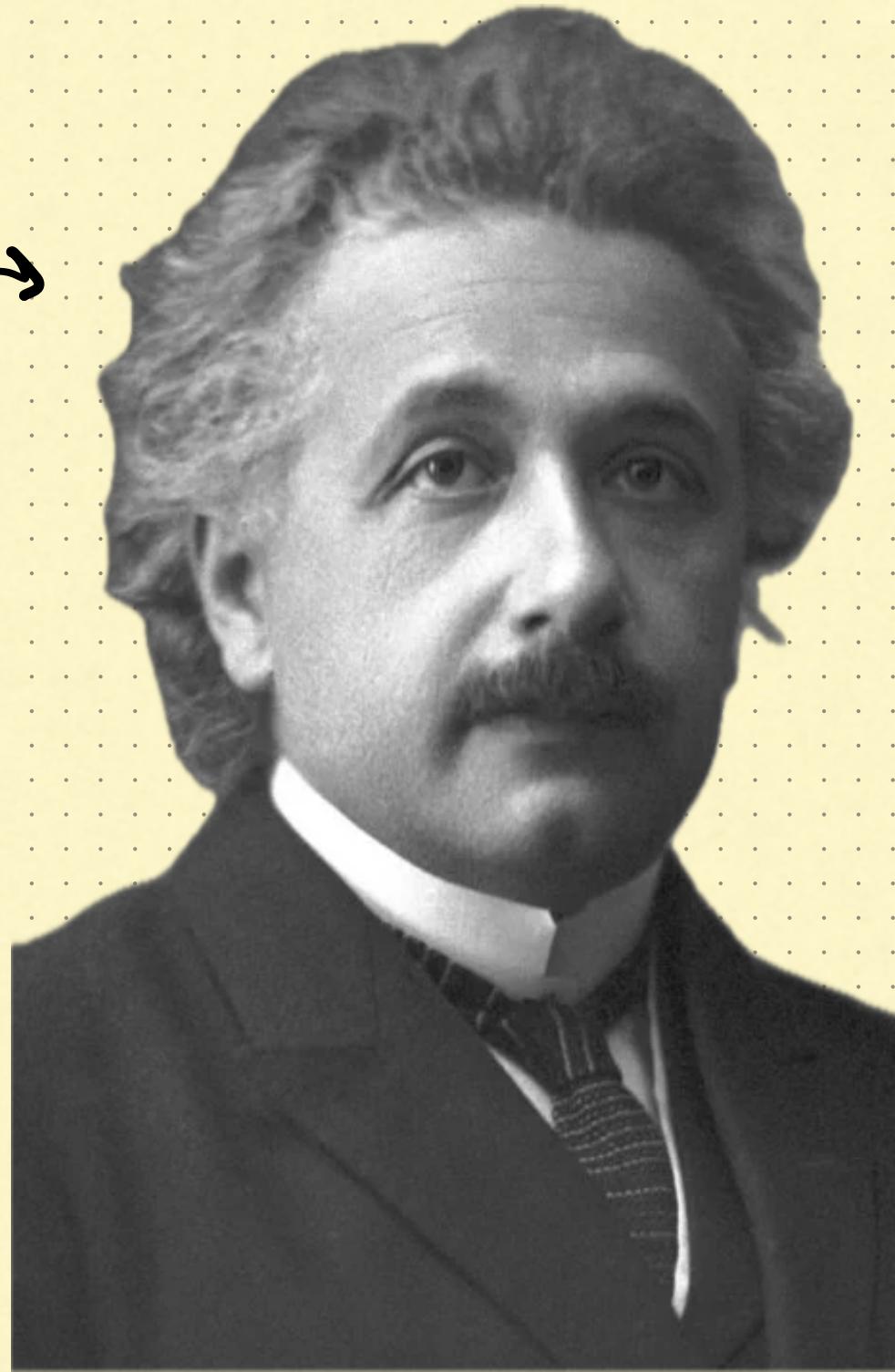
11th Prado (splendid masterpieces by Goya, Raphael, Fra Angelico).

12th Trip to Zaragoza."

ZARAGOZA

(12-14 MARCH)

- CELEBRATED HIS BIRTHDAY
- TOOK THIS PICTURE (FEATURING IN NOBEL FOUNDATION)



CONCLUSIONS OF THE VISIT

- EXPERTS AGREE THAT EINSTEIN'S VISIT DID NOT :
 - SERVE TO EUROPEANIZE SPANISH SCIENCE
 - OPEN NEW LINES OF RESEARCH
- ALMOST NO ONE UNDERSTOOD HIS THEORIES
- MOST PEOPLE ACCEPTED RELATIVITY BUT THERE WERE SOME OPPONENTS
- PEOPLE LEFT WITH A GREAT FEELING OF ADMIRATION , HE WAS A SUPERSTAR
- EINSTEIN WAS CLOSE TO BECOME A PROFESSOR IN MADRID

SCIENCE

DURING THE VISIT

- CREATION OF MODERN COSMOLOGY
- EINSTEIN - FRIEDMANN CONTROVERSY

FRIEDMANN:

"...The case of a stationary universe includes only two possibilities, which have already been considered by Einstein and De Sitter. The case of a variable universe admits, on the other hand, many possible situations. In some cases, the radius of curvature of the universe increases steadily with time. And other situations correspond to a radius of curvature that changes periodically..."

FRIEDMANN:

"...Considering that the possible existence of a non-stationary universe is of interest, I would like to present the calculations I have made here so that you can verify and critically evaluate them. [He details all mathematical operations]. If you find the calculations, I present in this letter to be correct, please be so kind as to inform the editors of Zeitschrift für Physik about this conclusion. Perhaps in that case, you would like to publish a correction to the statement you have made, or at least allow me to publish the calculations part of this letter..."

EINSTEIN:

"...As for the non-stationary universe, the results contained in the work seem suspicious to me. The solution given for this case turns out not to satisfy the field equations..."

EINSTEIN:

"...In my previous note, I criticized Friedmann's work on the curvature of space. However, a letter from Mr. Friedmann, which Mr. Krutkov handed me, has convinced me that my criticism was based on an error in my calculations. Now I consider that the results of Mr. Friedmann are correct and bring new light. It is shown that the field equations and the static solution also admit dynamic solutions (i.e., with a variable time-coordinate), with central symmetry for the spatial structure."