

How the Planets Affect Our Daily Lives ...

... A Brief History of Uncertainty



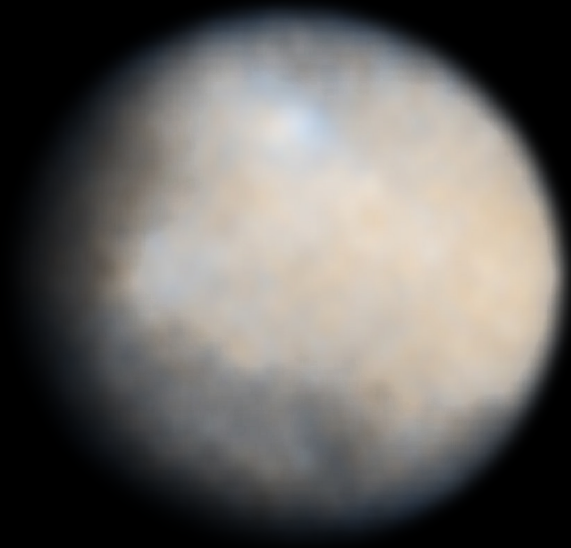


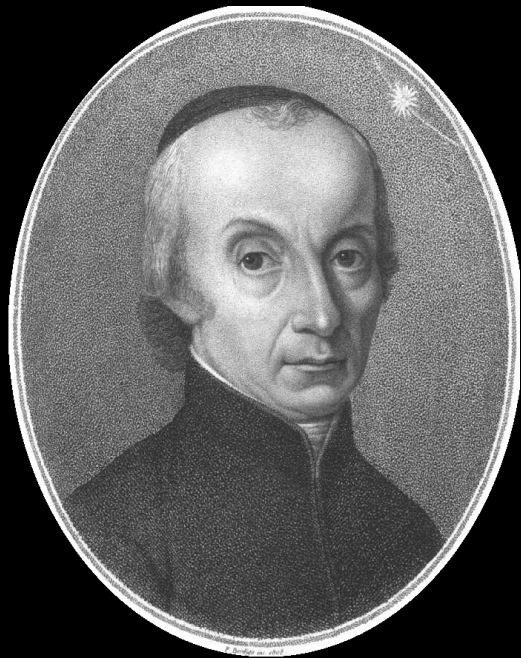






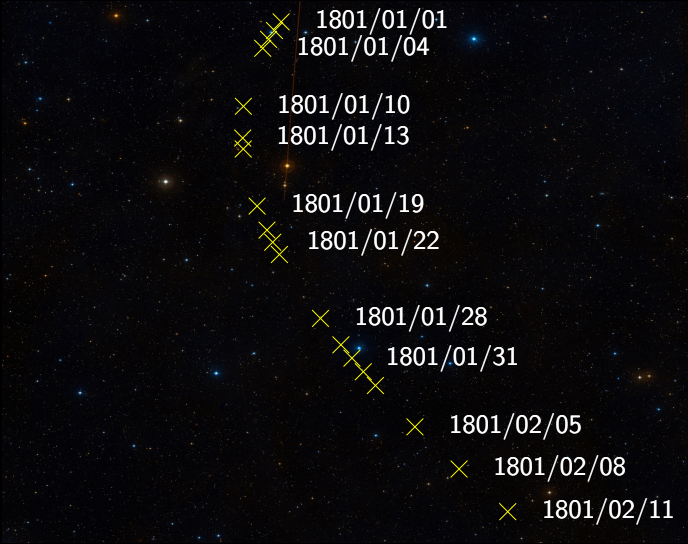






Beobachtungen des zu Palermo d. 1. Jan. 1801 von Prof. Piazzi neu entdeckten Gestirns.

1801	Mittlere Sonnen- Zeit	Gerade Aufstieg in Zeit	Gerade Auf- steigung in Graden	Nördl. Abweich.	Geocentri- sche Länge	Geocentri- Breite	Ort der Sonne + 20" Aberration	Logar. d. Distanz ☉ 3
	St	St			Z		Z	
Jan.	1 8 43 37,8	3 27 11,25	51 47 48,8	15 37 43,5	1 23 22 58,3	3 6 42,1	9 11 1 30,9	9,9926156
	2 8 39 4,6	3 26 53,85	51 43 27,8	15 41 5,5	1 23 19 44,3	3 2 24,9	9 12 2 38,6	9,9926317
	3 8 34 53,3	3 26 38,4	51 39 36,0	15 44 31,6	1 23 16 58,6	2 58 9,9	9 13 3 26,6	9,9926324
	4 8 30 42,1	3 26 23,15	51 35 47,3	15 47 57,6	1 23 14 15,5	2 53 55,6	9 14 4 14,9	9,9926418
	10 8 6 15,8	3 25 32,1	51 23 1,5	16 10 32,0	1 23 7 59,1	2 29 0,6	9 20 10 17,5	9,9927641
	11 8 2 17,5	3 25 29,73	51 22 26,6	16 12 49,5	1 23 10 37,6	2 16 59,7	9 23 12 13,8	9,9928490
	13 7 54 26,2	3 25 30,30	51 22 34,5	16 22 49,5	1 23 12 1,2	2 12 56,7	9 24 14 13,5	9,9928809
	14 7 50 31,7	3 25 31,72	51 22 55,8	16 27 3,7	1 23 12 1,2	2 12 56,7	9 24 14 13,5	9,9928809
	17 7 35 11,3	3 25 55,1	51 28 45,0	16 40 13,0	1 23 25 59,2	1 53 38,2	9 29 19 53,8	9,9930607
	19 7 31 28,5	3 26 8,15	51 32 27,3	16 49 16,1	1 23 34 21,3	1 46 6,0	10 1 20 40,3	9,9931434
	21 7 24 2,7	3 26 34,27	51 38 34,1	16 58 35,9	1 23 39 1,8	1 42 28,1	10 2 21 32,0	9,9931886
	22 7 20 31,7	3 26 49,42	51 42 21,2	17 3 18,5	1 23 44 15,7	1 38 52,1	10 3 22 22,7	9,9932348
	23 7 16 45,5	3 27 6,90	51 46 43,5	17 8 5,5	1 24 15 15,7	1 21 6,9	10 8 26 20,1	9,9935062
	28 6 58 51,3	3 28 54,53	52 13 38,3	17 32 54,1	1 24 30 9,0	1 14 16,0	10 10 27 46,2	9,9936332
	30 6 51 52,9	3 29 48,14	52 27 2,1	17 43 11,0	1 24 38 7,3	1 10 54,6	10 11 28 28,5	9,9937007
Febr.	1 6 44 59,9	3 30 47,2	52 41 48,0	17 53 36,3	1 24 46 19,3	1 7 30,9	10 12 29 9,6	9,9937703
	2 6 41 35,8	3 31 19,06	52 49 45,9	17 58 57,5	1 24 54 57,9	1 4 1,5	10 13 29 49,9	9,9938423
	5 6 31 31,5	3 33 2,70	53 15 40,5	18 15 1,0	1 25 22 43,4	0 54 23,9	10 16 31 45,5	9,9940751
	8 6 21 39,2	3 34 58,50	53 44 37,5	18 31 23,2	1 25 53 29,5	0 45 5,0	10 19 33 33,3	9,9943276
	11 6 11 58,2	3 37 6,54	54 16 38,2	18 47 58,8	1 26 26 40,0	0 36 2,9	10 22 35 11,4	9,9945823



1801/01/01  
1801/01/04

× 1801/01/10

× 1801/01/13

× 1801/01/19

× 1801/01/22

× 1801/01/28

× 1801/01/31

× 1801/02/05

× 1801/02/08

× 1801/02/11





hier in der Nähe der Quadratur der Einfluß der Sonnen-Länge geringer ist, als in andern Lagen. Dr. Gauss glaubt daher, daß es nicht undenklich wäre, wenn man die Fehler der Sonnentafeln aus sehr genauen Beobachtungen für diese Zeiten bestimmte, und die Örter der Sonne hiernach verbesserte. Diese verbesserten Elemente sind nun folgende:

Sonnenferne . . .	326° 27' 38"	Hieraus:	
Ö . . . . .	81 0 44	größte Mittelp. Glef.	
Neigung . . .	10 36 57	chung . . . . .	9° 27' 41"
Log. halb. gr. Axe	0.4420527	logl. mittlere helioc.	
Excentricität . .	0.0825017	tropische Beweg.	770.914
Epoch 1800 31 Dec.	77° 36' 34"		

Aus diesen Elementen hat Dr. Gauss folgende Örter der *Ceres Ferdinandea* im voraus berechnet. Die Zeit ist mittlere für Mitternacht in Palermo.

1801	Gröczen- trische Länge	Gröczen- trische Breite nordl.	Logarith. des Ab- standes von der S	Logarith. des Ab- standes von der C	Verhält- niß der ge- hehenen Helligk.
	Z				
Nov. 25	5 20 16	9 25	0.42181	0.40468	0.6102
Dec. 1	5 22 15	9 48	0.40940	0.40472	0.6459
	5 24 7	10 12	0.39643	0.40479	0.6855
	13 5 25 11	10 37	0.38296	0.40488	0.7290
	19 5 27 27	11 4	0.36902	0.40499	0.7770
	25 5 28 53	11 32	0.35468	0.40512	0.8295
	31 6 0 10	12 1	0.34000	0.40528	0.8869

Sollte man den Ort des Planeten nach diesen Elementen genauer, oder auf eine längere Zeit berechnen wollen: so setzen wir zu diesem Behufe noch folgende Formeln hierher:

1) Zur

Excentricität  $e = 0,081307$  | Aphelische Beweg. 770,914  
 Epoche 1800 31 Dec.  $77^{\circ} 36' 34''$

Aus diesen Elementen hat Dr. *Gauß* folgende  
 Örter der *Ceres Ferdinandea* im voraus berechnet.  
 Die Zeit ist mittlere für Mitternacht in *Palermo*.

1801	Geocen- trische Länge	Geocen- trische Breite nördl.	Logarith. des Ab- standes von der ☿	Logarith. des Ab- standes von der ☾	Verhält- niß der ge- sehenen Helligk.
	Z				
Nov. 25	5 20 16	9 25	0,42181	0,40468	0,6102
Dec. 1	5 22 15	9 48	0,40940	0,40472	0,6459
	7 5 24 7	10 12	0,39643	0,40479	0,6855
	13 5 25 51	10 37	0,38296	0,40488	0,7290
	19 5 27 27	11 4	0,36902	0,40499	0,7770
	25 5 28 53	11 32	0,35468	0,40512	0,8295
	31 6 0 10	12 1	0,34000	0,40528	0,8869

Sollte man den Ort des Planeten nach diesen Ele-  
 menten genauer, oder auf eine längere Zeit berech-  
 nen wollen: so setzen wir zu diesem Behufe noch  
 folgende Formeln hierher:



DELLA SCOPERTA  
DEL NUOVO PIANETA  
CERERE FERDINANDEA

OTTAVO TRA I PRIMAII DEL NOSTRO SISTEMA  
SOLARE.



PALERMO  
1802

NELLA STAMPERIA REALE.





Mercury

Venus

Earth

Mars

Jupiter

Saturn

Uranus

Neptune

— “Planets”

Ceres

— “Dwarf  
Planets”

Pluto

Haumea

Makemake

Eris

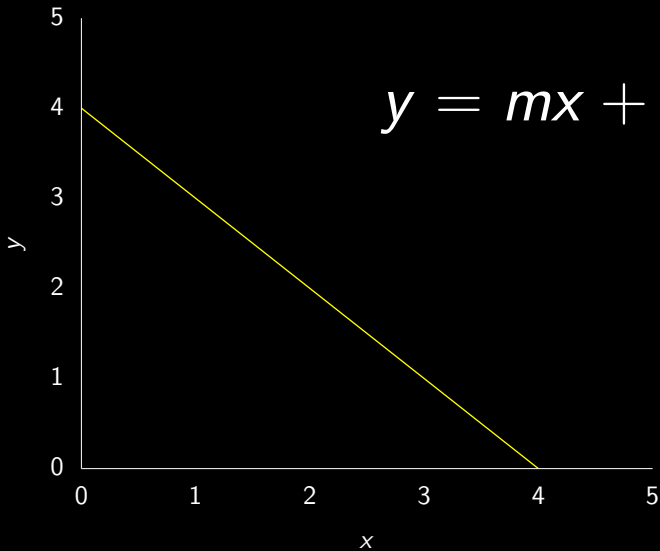


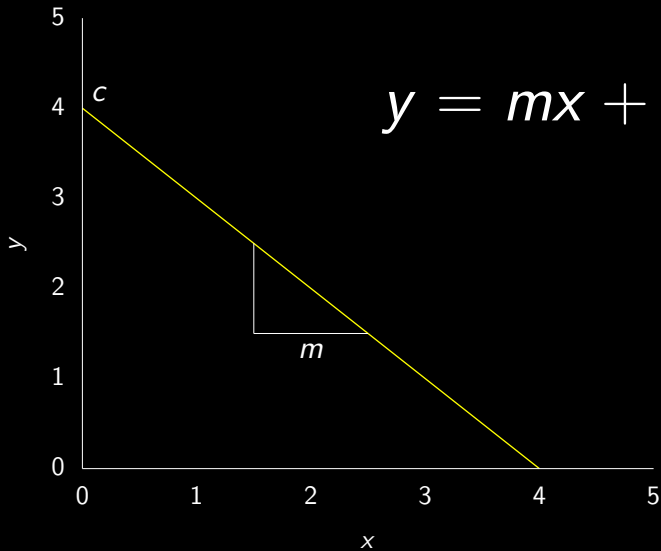


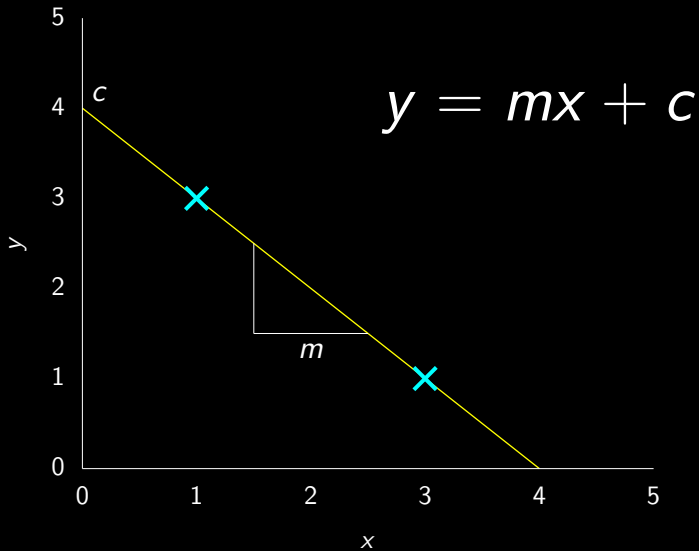


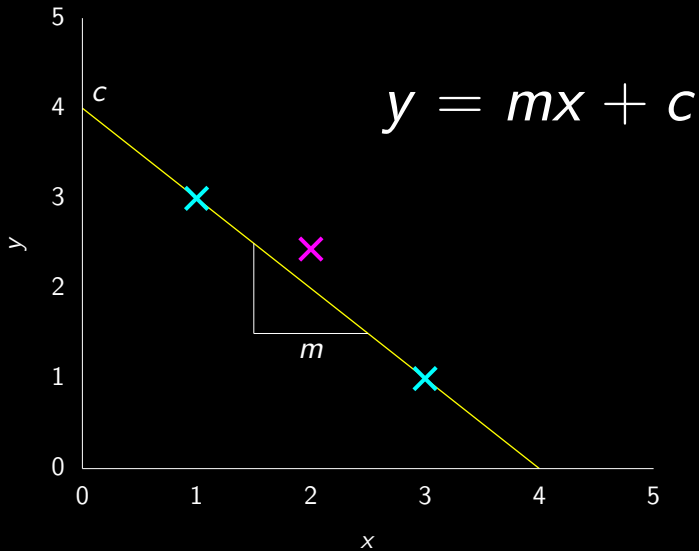
$$y = mx + c$$

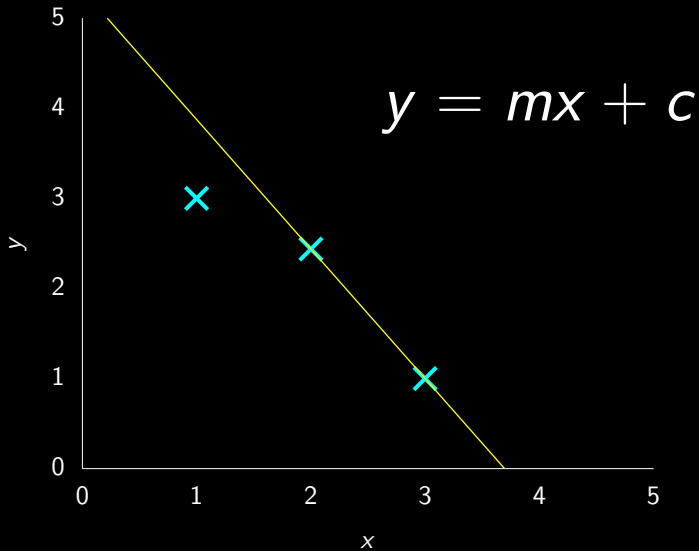
$$y = mx + c$$

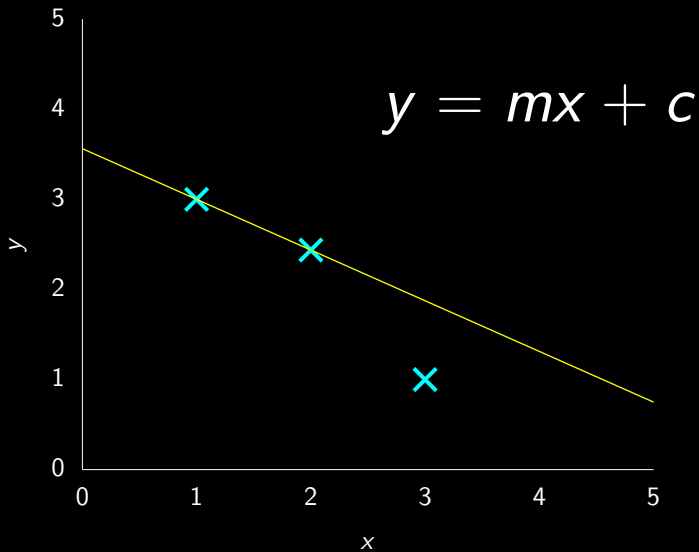




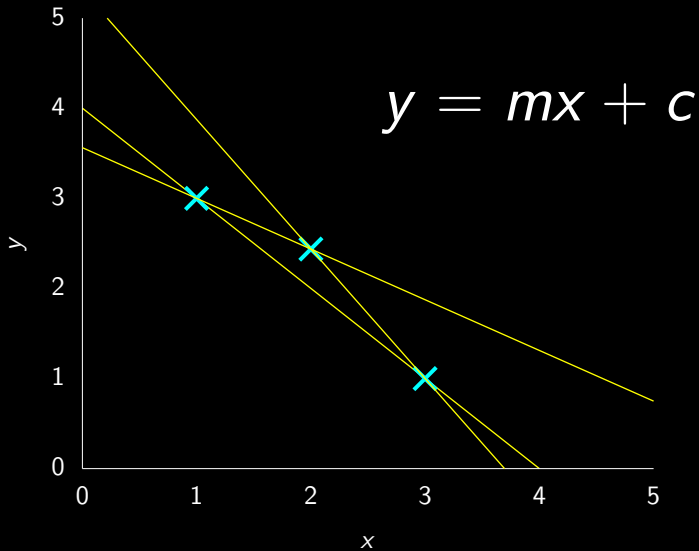












$$y = mx + c$$

point 1:  $x = 1, y = 3$

$$3 = m + c$$

point 2:  $x = 3, y = 1$

$$1 = 3m + c$$

point 3:  $x = 2, y = 2.5$

$$2.5 = 2m + c$$

$$y = mx + c + \epsilon$$

point 1:  $x = 1, y = 3$

$$3 = m + c + \epsilon_1$$

point 2:  $x = 3, y = 1$

$$1 = 3m + c + \epsilon_2$$

point 3:  $x = 2, y = 2.5$

$$2.5 = 2m + c + \epsilon_3$$



other, we say that its choice is an effect without a cause. It is then, says Leibnitz, the blind chance of the Epicureans. The contrary opinion is an illusion of the mind, which, losing sight of the evasive reasons of the choice of the will in indifferent things, believes that choice is determined of itself and without motives.

We ought then to regard the present state of the universe as the effect of its anterior state and as the cause of the one which is to follow. Given for one instant an intelligence which could comprehend all the forces by which nature is animated and the respective situation of the beings who compose it—an intelligence sufficiently vast to submit these data to analysis—it would embrace in the same formula the movements of the greatest bodies of the universe and those of the lightest atom; for it, nothing would be uncertain and the future, as the past, would be present to its eyes. The human mind offers, in the perfection which it has been able to give to astronomy, a feeble idea of this intelligence. Its discoveries in mechanics and geometry, added to that of universal gravity, have enabled it to comprehend in the same analytical expressions the past and future states of the system of the world. Applying the same method to some other objects of its knowledge, it has succeeded in referring to general laws observed phenomena and in foreseeing those which given circumstances ought to produce. All these efforts in the search for truth tend to lead it back continually to the vast intelligence which we have just mentioned, but from which it will always remain infinitely removed. This tendency, peculiar to the human race, is that which renders it superior to animals; and their progress

choice is determined of itself and without motives.

We ought then to regard the present state of the universe as the effect of its anterior state and as the cause of the one which is to follow. Given for one instant an intelligence which could comprehend all the forces by which nature is animated and the respective situation of the beings who compose it—an intelligence sufficiently vast to submit these data to analysis—it would embrace in the same formula the movements of the greatest bodies of the universe and those of the lightest atom; for it, nothing would be uncertain and the future, as the past, would be present to its eyes. The human mind differs in the perfection which it has



rw.ted.com/talks/neil\_burgess\_how\_your\_brain\_tells\_you\_where\_you

height: "The day will come when, by study pursued through several ages, the things now concealed will appear with evidence; and posterity will be astonished that truths so clear had escaped us." Clairaut then undertook to submit to analysis the perturbations which the comet had experienced by the action of the two great planets, Jupiter and Saturn; after immense calculations he fixed its next passage at the perihelion toward the beginning of April, 1759, which was actually verified by observation. The regularity which astronomy shows us in the movements of the comets doubtless exists also in all phenomena. .

The curve described by a simple molecule of air or vapor is regulated in a manner just as certain as the planetary orbits; the only difference between them is that which comes from our ignorance.

Probability is relative, in part to this ignorance, in part to our knowledge. We know that of three or a greater number of events a single one ought to occur; but nothing induces us to believe that one of them will occur rather than the others. In this state of indecision it is impossible for us to announce their occurrence with certainty. It is, however, probable that one of these events, chosen at will, will not occur because we see several cases equally possible which exclude its occurrence, while only a single one favors it.

The theory of chance consists in reducing all the events of the same kind to a certain number of cases equally possible, that is to say, to such as we may be equally undecided about in regard to their existence, and in determining the number of cases favorable to the event whose probability is sought. The ratio of



shows us in the movements of the comets doubtless exists also in all phenomena. -

The curve described by a simple molecule of air or vapor is regulated in a manner just as certain as the planetary orbits; the only difference between them is that which comes from our ignorance.

Probability is relative, in part to this ignorance, in part to our knowledge. We know that of three or a



DANIEL BERNOULLIUS

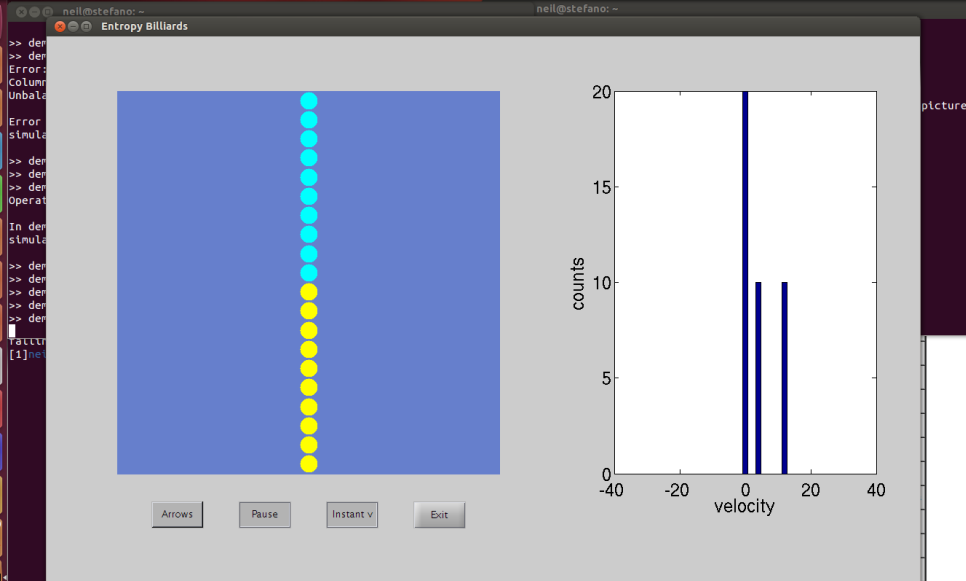
*Med. D. Professor honorarius Academiae Imper.  
Petropolitanae, Anatomiae & Botanicae P.P.O. in  
Academia Basiliensi.*

*Nat. d. 29. Ian. A.S.R. MDC.*

*J. J. H. de la Roche, Pinx.*

*Del. III.*

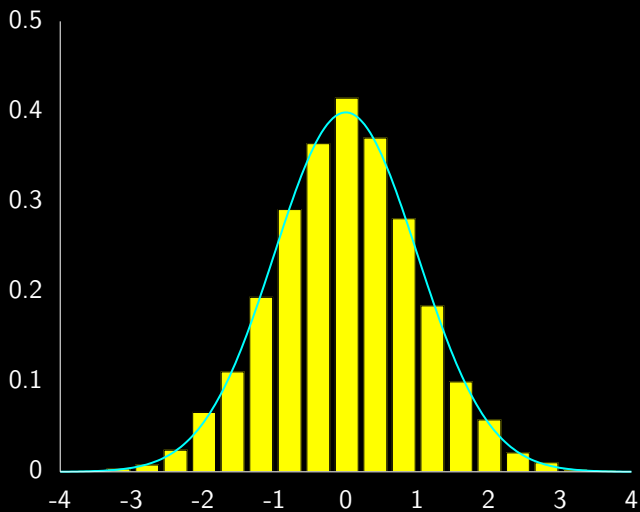
*J. J. H. de la Roche, Pinx.*

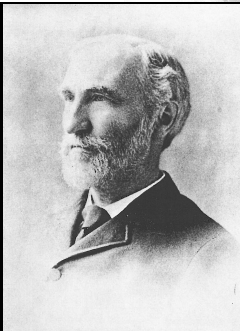


Class of graphics object

UIContextMenu

Uicontextmenu object associated with the uicontrol







# THE NATURE OF THE PHYSICAL WORLD

by  
A. S. EDDINGTON  
M.A., LL.D., B.Sc., F.R.S.  
*Pembroke Professor of Astronomy  
in the  
University of Cambridge*

THE  
GIFFORD LECTURES  
1927

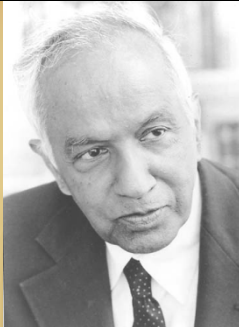
NEW YORK:  
THE MACMILLAN COMPANY  
CAMBRIDGE, ENGLAND:  
AT THE UNIVERSITY PRESS  
1929

All rights reserved

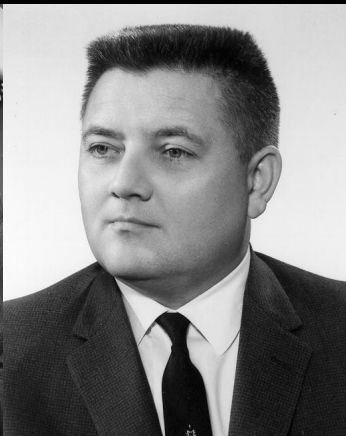
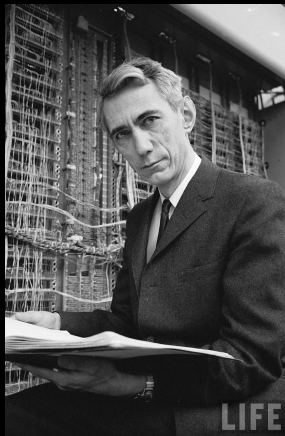
## 74 THE RUNNING-DOWN OF THE UNIVERSE

The uniform march of a regiment is not the only form of organised motion; the organised evolutions of a stage chorus have their natural analogue in sound waves. A common measure can now be applied to all forms of organisation. Any loss of organisation is equitably measured by the chance against its recovery by an accidental coincidence. The chance is always regarded as a contingency, but it is precise as a measure.

The practical measure of the random element which can increase in the universe but can never decrease is called entropy. Measuring by entropy is the same as measuring by the chance equated in the last paragraph, only the unmanageably large numbers are transformed (by a simple formula) into a more convenient scale of reckoning. Entropy continually increases. We can, by isolating parts of the world and postulating rather idealised conditions in our problems, arrest the increase, but we cannot turn it into a decrease. That would involve something much worse than a violation of an ordinary law of Nature, namely, as improbable coincidence. The law that entropy always increases—the second law of thermodynamics—holds, I think, the supreme position among the laws of Nature. If someone points out to you that your pet theory of the universe is in disagreement with Maxwell's equations—then so much the worse for Maxwell's equations. If it is found to be contradicted by observation—well, these experimentalists do hump things sometimes. But if your theory is found to be against the second law of thermodynamics I can give you no larger argument for it but to collapse in deepest humiliation. This exaltation of the second law is not unreasonable. There are other laws which we have strong reason to believe in, and we feel that a hypothesis which violates them is highly



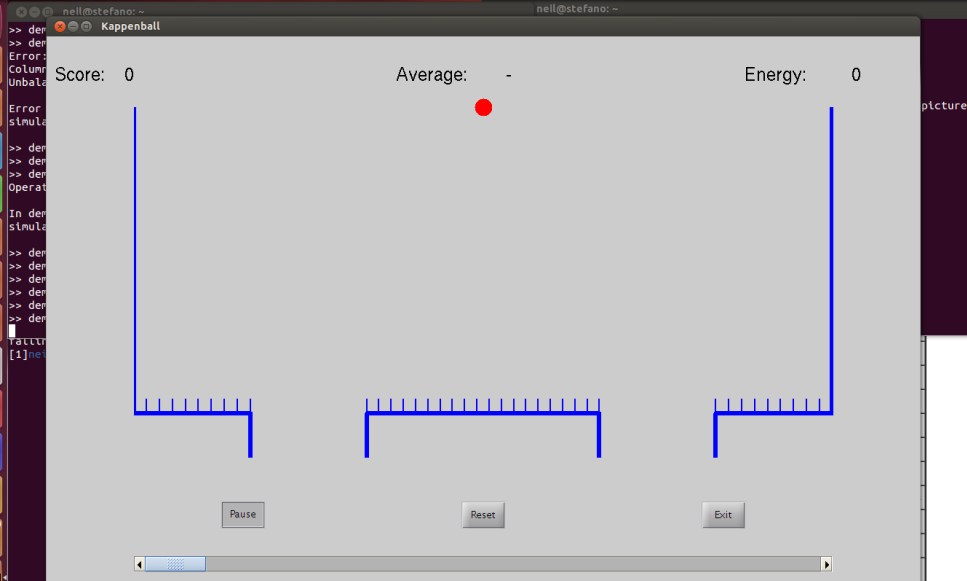
ordinary law of Nature, namely, an improbable coincidence. The law that entropy always increases—the second law of thermodynamics—holds, I think, the supreme position among the laws of Nature. If someone points out to you that your pet theory of the universe is in disagreement with Maxwell's equations—then so much the worse for Maxwell's equations. If it is found to be contradicted by observation—well, these experimentalists do bungle things sometimes. But if your theory is found to be against the second law of thermodynamics I can give you no hope; there is nothing for it but to collapse in deepest humiliation. This exaltation







[http://videlectures.net/aispds08\\_kappen\\_easop/](http://videlectures.net/aispds08_kappen_easop/)



Class of graphics object

UIContextMenu

Uicontextmenu object associated with the uicontrol

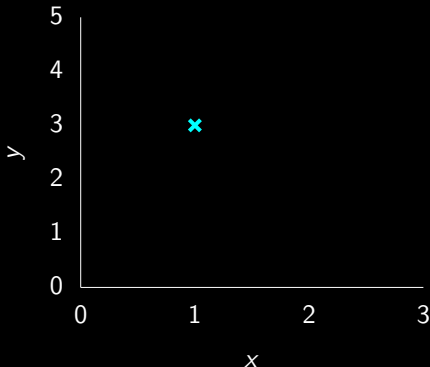




# Underdetermined System

What about two unknowns and *one* observation?

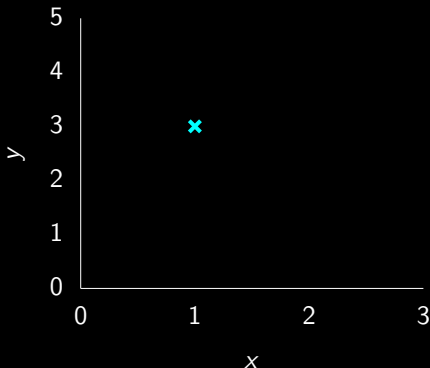
$$y_1 = mx_1 + c$$



# Underdetermined System

Can compute  $m$  given  $c$ .

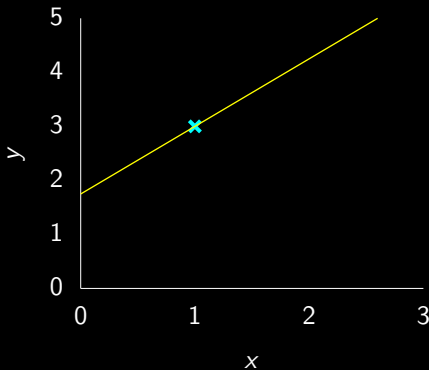
$$m = \frac{y_1 - c}{x}$$



# Underdetermined System

Can compute  $m$  given  $c$ .

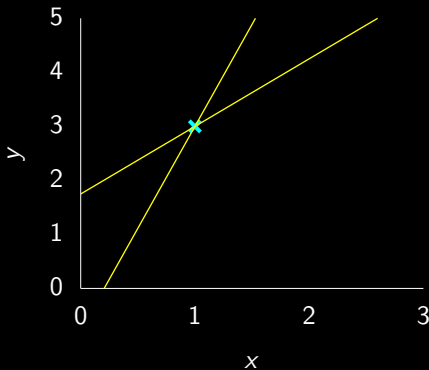
$$c = 1.75 \implies m = 1.25$$



# Underdetermined System

Can compute  $m$  given  $c$ .

$$c = -0.777 \implies m = 3.78$$

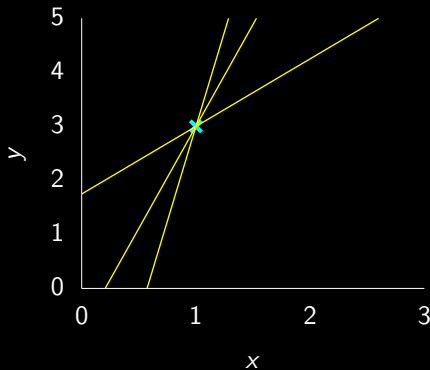




# Underdetermined System

Can compute  $m$  given  $c$ .

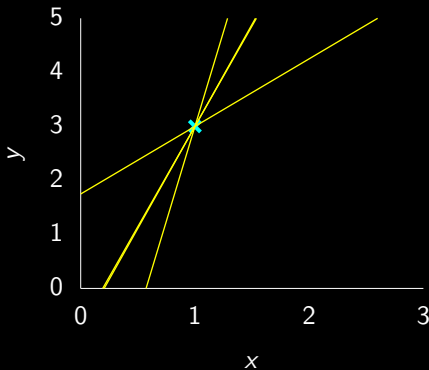
$$c = -4.01 \implies m = 7.01$$



# Underdetermined System

Can compute  $m$  given  $c$ .

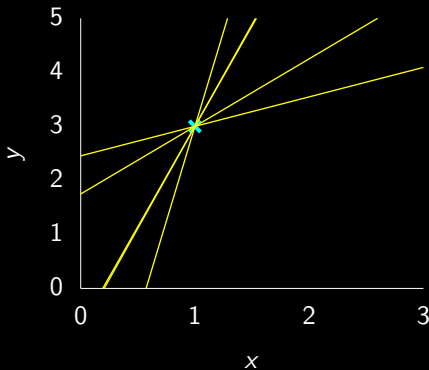
$$c = -0.718 \implies m = 3.72$$



# Underdetermined System

Can compute  $m$  given  $c$ .

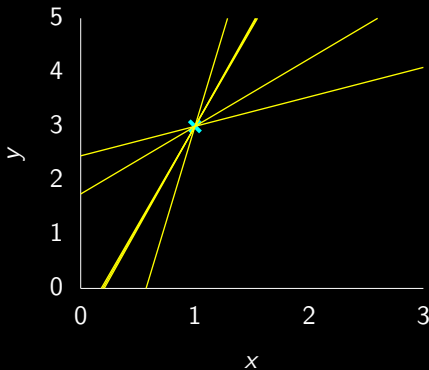
$$c = 2.45 \implies m = 0.545$$



# Underdetermined System

Can compute  $m$  given  $c$ .

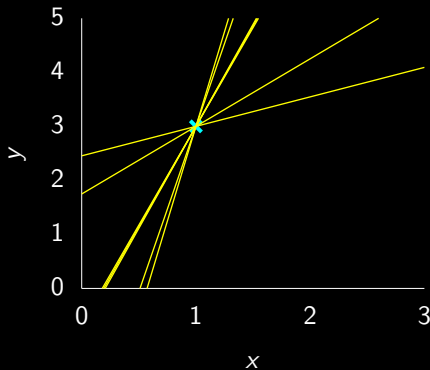
$$c = -0.657 \implies m = 3.66$$



# Underdetermined System

Can compute  $m$  given  $c$ .

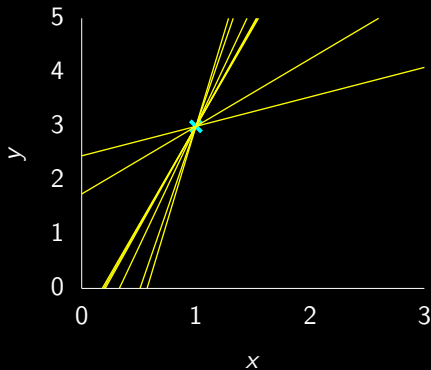
$$c = -3.13 \implies m = 6.13$$



# Underdetermined System

Can compute  $m$  given  $c$ .

$$c = -1.47 \implies m = 4.47$$



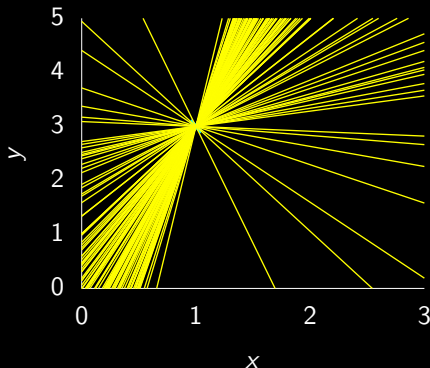
# Underdetermined System

Can compute  $m$  given  $c$ .

Assume

$$c \sim \mathcal{N}(0, 4),$$

we find a distribution of solutions.



1601 Willow Rd Menlo Park, CA 94025, United States+1 650-543-480

Google Maps

Map Traffic

1000 mi  
1000 km

WATER-POLO....doc

Lecture\_iCeNS....pptx

Show all downloads...



1601 Willow Rd Menlo Park

<https://maps.google.co.uk/maps?q=1601+Willow+Rd+Menlo+Park,+CA+94025,+United+States%2B1+543-480>

My Boosters LastPass - Dow... Add to TripIt Proverbi napol... IEEE Xplore - On... Google Maps Other Bookmarks

+You Search Images Maps Play YouTube News Gmail Drive Calendar More -

Google 1601 Willow Rd Menlo Park, CA 94025, United States+1 650-543-480

Sign in

Map Traffic

500 mi  
500 km

WATER-POLO....doc Lecture\_iCeNS....pptx

Imagery ©2013 TerraMetrics, Map data ©2013 Google, INEGI

Show all downloads

1601 Willow Rd Menlo Park

<https://maps.google.co.uk/maps?q=1601+Willow+Rd+Menlo+Park,+CA+94025,+United+States%2B1>

My Boosters LastPass - Dow... Add to TripIt Proverbi napol... IEEE Xplore - On... Google Maps Other Bookmarks

+You Search Images Maps Play YouTube News Gmail Drive Calendar More -

Google 1601 Willow Rd Menlo Park, CA 94025, United States+1 650-543-480 Sign in

Map Traffic

100 mi 200 km

Imagery ©2013 NASA, TerraMetrics, Map data ©2013 Google, INEGI Report a problem

WATER-POLO....doc Lecture\_iCeN5....pptx Show all downloads

1601 Willow Rd Menlo Park, CA 94025, United States+1 650-543-480

Google Maps

1601 Willow Rd Menlo Park, CA 94025, United States+1 650-543-480

Sign in

Map

Traffic

10 mi  
20 km

Imagery ©2013 TerraMetrics, Map data ©2013 Google Edit in Google Map Maker Report a problem

WATER-POLO....doc

Lecture\_iCeNS....pptx

Show all downloads

1601 Willow Rd Menlo Park

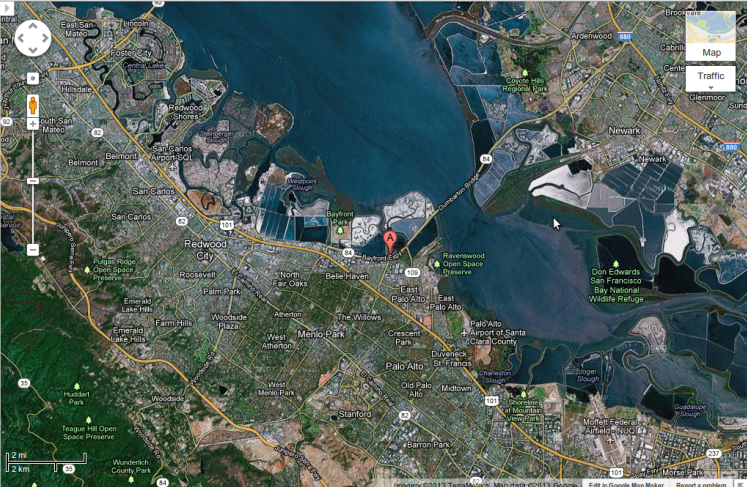
<https://maps.google.co.uk/maps?q=1601+Willow+Rd+Menlo+Park,+CA+94025,+United+States%2B1+>

My Boosters LastPass - Dow... Add to TripIt Proverbi napol... IEEE Xplore - On... Google Maps Other Bookmarks

+You Search Images Maps Play YouTube News Gmail Drive Calendar More -

Google 1601 Willow Rd Menlo Park, CA 94025, United States+1 650-543-480

Sign in



2 mi 2 km

Imagery ©2013 TerraMetrics, Map data ©2013 Google Edit in Google Map Maker Report a problem

WATER-POLO....doc Lecture\_iCeNS....pptx

Show all downloads

1601 Willow Rd Menlo Park

https://maps.google.co.uk/maps?q=1601+Willow+Rd+Menlo+Park,+CA+94025,+United+States%2B1+☆

My Boosters LastPass - Dow... Add to TripIt Proverbi napol... IEEE Xplore - On... Google Maps Other Bookmarks

+You Search Images Maps Play YouTube News Gmail Drive Calendar More -

Google 1601 Willow Rd Menlo Park, CA 94025, United States+1 650-543-480

Sign in

Map Traffic

1000 ft 200 m

Images ©2013 DigitalGlobe, GeoEye, U.S. Geological Survey, USDA Farm Service Agency, Map data ©2013 Google

WATER-POLO....doc Lecture\_iCeNS....pptx

Show all downloads



1601 Willow Rd Menlo Park

<https://maps.google.co.uk/maps?q=1601+Willow+Rd+Menlo+Park,+CA+94025,+United+States%2B1>

My Boosters LastPass - Dow... Add to TripIt Proverbi napol... IEEE Xplore - On... Google Maps Other Bookmarks

+You Search Images Maps Play YouTube News Gmail Drive Calendar More -

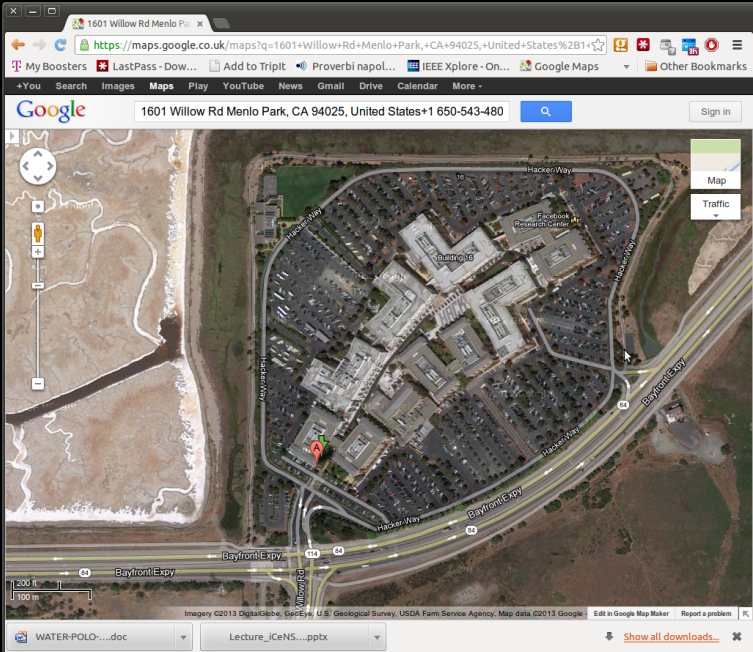
Google 1601 Willow Rd Menlo Park, CA 94025, United States+1 650-543-480 Sign in

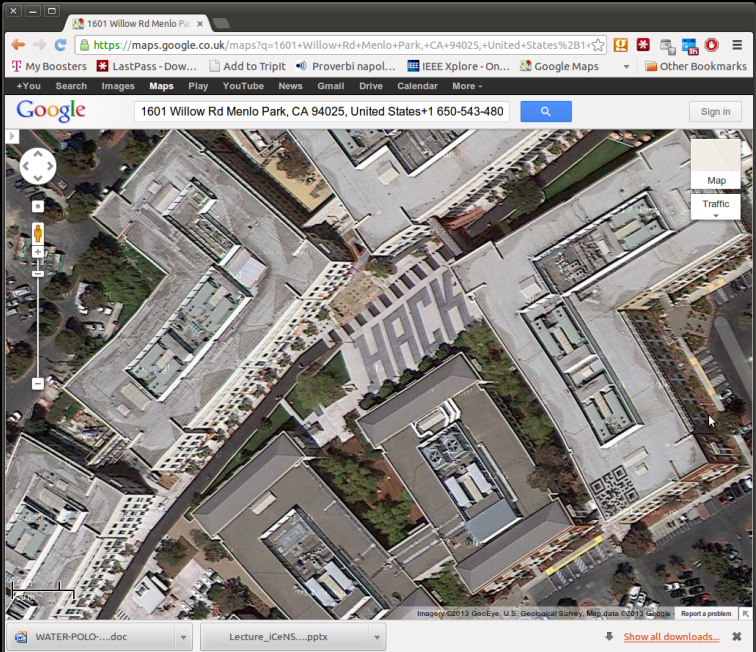
Map Traffic

200 ft 100 m

Imagery ©2013 DigitalGlobe, GeoEye, U.S. Geological Survey, USDA Farm Service Agency, Map data ©2013 Google Edit in Google Map Maker Report a problem

WATER-POLO....doc Lecture\_iCeNS....pptx Show all downloads

A satellite map view of the Facebook Menlo Park campus. The map shows several large, interconnected office buildings with flat roofs and parking lots. The campus is situated near a body of water on the left and a highway (Bayfront Expressway) on the right. A red location pin is placed on one of the buildings. The interface includes a search bar at the top with the address "1601 Willow Rd Menlo Park, CA 94025, United States", a sidebar on the left with navigation controls, and a bottom bar with file explorer elements.











Joaquin Quiñonero Candela

Update Info

Activity Log   

-  Works at Facebook
-  Studied at Technical University of Denmark
-  Lives in Palo Alto, California
-  Married to Ines Koch

About



Friends 523



Photos 73

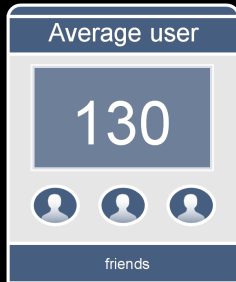


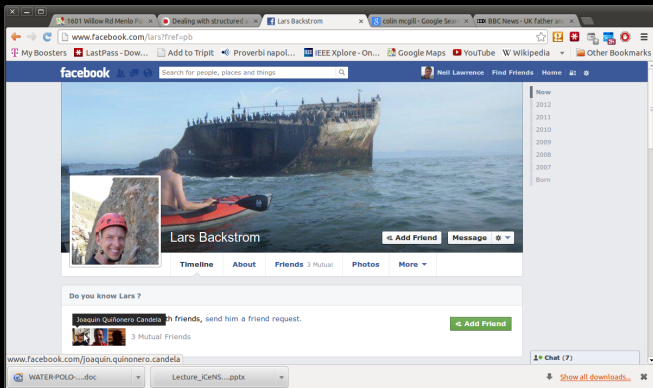
Map 133



Likes 79

6 





[http://videlectures.net/eswc2011\\_backstrom\\_facebook/](http://videlectures.net/eswc2011_backstrom_facebook/)