

Impact of  
WWI  
1914-1919  
on  
people, skills,  
infrastructure, culture,  
international cooperation

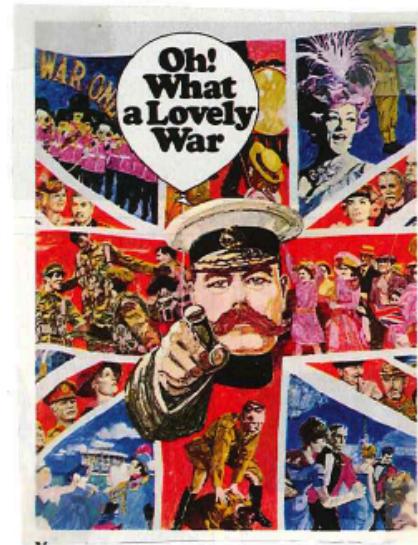
in

Physics



IAU Div. C  
Aug 2015

ACS SF  
August 1914  
2014



Dr. Virginia Trimble  
University Of California  
4575 Physics  
Irvine, CA 92697-0001



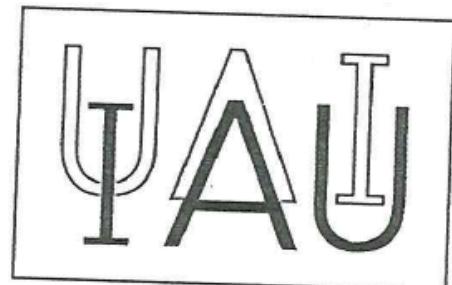
A Teachable Century  
Chemistry



APS BALTIMORE APR.

Passchendaele (Ypres)  
Oct 1917

Astronomy



API Heidelberg MAR 2015

## A SORT OF OUTLINE

How I came to the subject

WIMPI-creep; shelves full of Nature (and not much else), with first examined issue about imprisonment of German eclipse expedition in Crimea (August 1914)

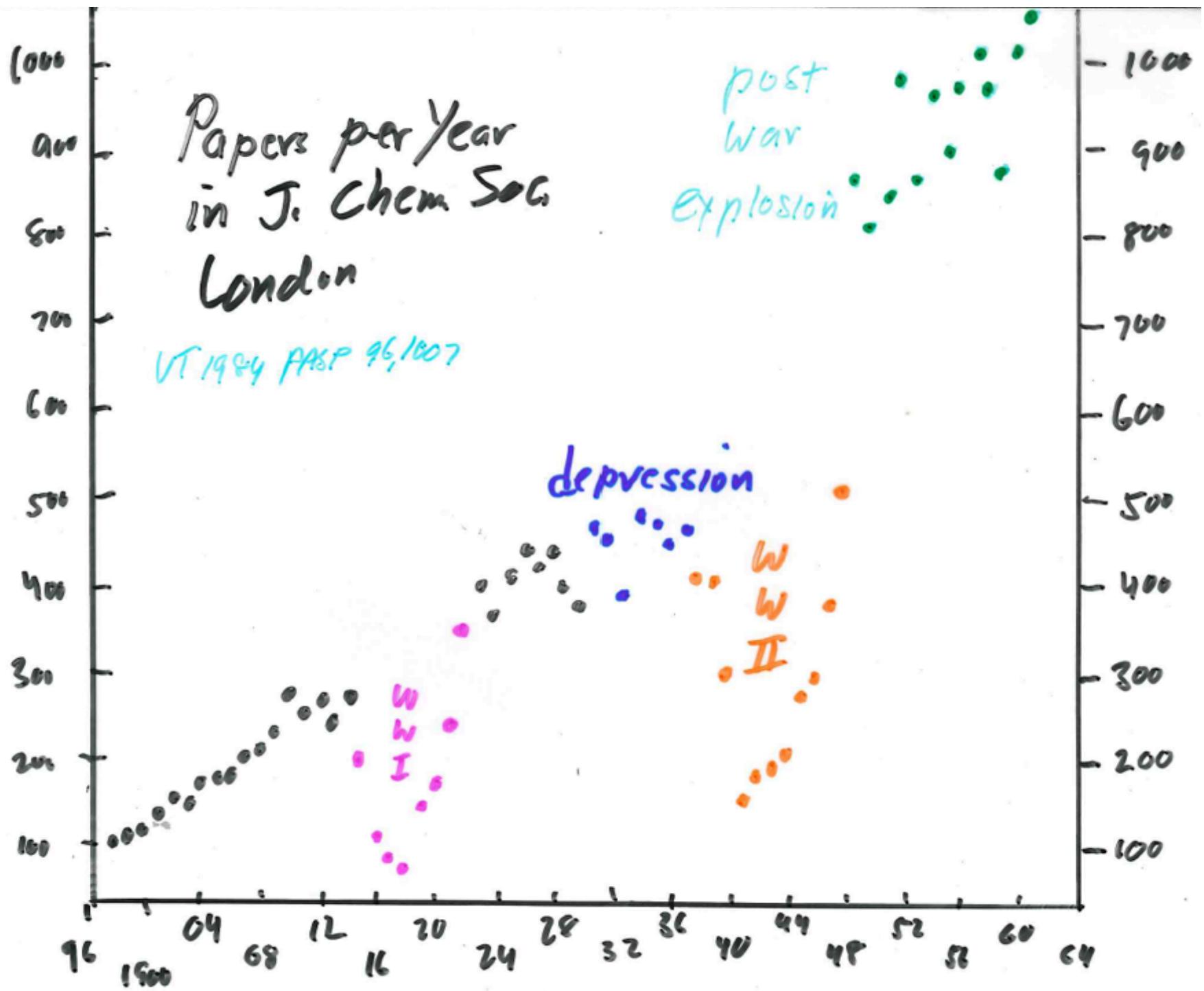
What else were people doing in 1914?

Caruso (signing autographs), C.B. De Mille (1st Hollywood feature (The Squaw Man), and

NAACP founded, first US Mothers' Day, first CRC handbook, 1st major league game in Wrigley Field (Chicago Federals defeated Kansas City Packers, 9:1), Dylan Thomas born Ludlow Massacre (Colorado coal strike), ASCAP founded, 1st Chaplin film & 1st "Tramp" film, Holst Planets, Joe Hill arrested, start of Shackleton expedition, 1st Rose Bowl game, Milankovich cycles, Picasso's "Guitar" Max von Laue's Nobel for X-ray crystallography, Panama Canal opened, Federal Trade Commission, Clayton Anti-trust Act, Marines occupy Veracruz, UK foreign secr. says he has never seen Eur. so peaceful

Add your own favorites

Status of chem, phys, astr in 1914; BASI 49, 465-486





Hollywood Heritage  
A CELEBRATION is in the works for the 100th anniversary of Cecil B. DeMille's "The Squaw Man."

First full-length feature  
shot in LA by Lasky  
Feature Play Co. 1914  
The Squaw Man  
Gen. Manager Samuel  
Goldfisch . Starred  
Dustin Farnum



## "SHAKING HANDS WITH SHAKESPEARE"

Sir William H. McCrea: "When I was very young, I met an elderly member of the Sedgewick family who had known someone who had known someone who had known Newton."

VT: Moseley in one, via the younger Bragg

Emmi Noether in one, via Olga Tauskey Todd

Our Nobelists reach all earlier Nobel winners (not Tomonaga!) via a few steps in the Swedish Royal line

At Kyoto & Haige IAUs, you may have met Japanese & Dutch royals (though 1988 was opened by the mayor of Baltimore)

What interesting chains do you belong to?

NOW ask students to interview oldest member of family (who is still compos mentis) and trace their chains

Families of recent immigrants might reach Ho Chi Minh, Mao Tse Tung (me only via Nixon), Porfirio Diaz etc, perhaps also science lines in other countries.

Ask them what language(s) might they need to know to communicate along their chains

NOW go back in your own life and trace some non-science chains

Various possible individual & class projects; unexpected chain intersections (I met Igor Stravinsky; anybody else?)

## SIMULTANEOUS EVENTS IN

Science

(both)

Society

1908

K Schwarzschild  
vel. ellipsoid

Haber fixes N

Austria annexes Bosnia &  
Herzegovina from Ott.  
Empire (B&H object)

1914

Shapley to Mt. W.  
Slipher 40 S V<sub>r</sub>'s  
at AASFreundlich  
eclipse exp. in  
captured in CrimeaFranklin-Adams  
plates published  
Kapteyn star stream  
velocities; considers absorptionFrench use tear  
gas on W front

Wolf RAS Gold medal

absorption

Cepheids in M31  
& NGC 6822 EPH

1923

Sarajevo and all  
to Guns of August  
Hitler volunteers to  
Bavarian army,serves as dispatch  
runnerLouvain U library  
burned

Beer Hall Putsch

This can be done for just about any year 1908-1923, but  
 really hard to space columns, so rest have sci & soc  
 separated

## SCIENCE

- 1909 SS not at MW center, Bohlin, gl. cls. on sky
- 1910 RAS Gold to Sir David Gill (so hem work)
- 1911 Rutherford atom
- 1912 Leavitt Ceph. P-L, Slipher first Gal. V<sub>r</sub> (M31)
- 1913 Hertzsprung calibrates Ceph P-L, Moseley first atomic weight paper; 1917 Barkla Nobel should have been his  
A note on Nobels - given almost continuously 1908-39, and not MUCH discrimination between winners & losers of WWI
- A note on RAS Gold Medals, also given continuously, but after Max Wolf summer 1914, next real German is Unsold in 1957 (though Michelson 23 & Einstein 26, both German-born Jews)
- 1914 also Schuster-Schwarzschild (K.) approx.
- 1915 AEinstein completes GR (note: he had urged the 1914 Crimea expedition to look for pre-GR light bending)  
Moseley killed at Gallipoli (also Bragg's other son)
- 1916 K. Schwarzschild papers on GR metric, ballistics & dies, Van Maanen thinks S's rotate in plane of sky
- 1917 Hubble defends PhD and volunteers

- 1917 Curtis & Crommelin support Island Universes,  
de Sitter solution, Einstein static univ
- 1918 Shapley's giant Milky Way, SS not at center, Weyl U.  
Oberth's broth killed, Schroedinger U with vacuum E  
Kulik brings back sample of Tver meteorite
- 1916(oops) P Kempf measure solar rotation from Potsdam (flocculi)  
Nature continues to report German comet, variable star,  
etc results coming via Copenhagen  
Eddington Standard Model; receives news of GR from de Sitter)
- 1919 Hubble to Mt W; Solar eclipse expedition finds light bent  
Shapley opposes external galaxies, Perrir (telesite meter)  
says stars live on fusion  
IAU Founded in Brussels (last Solar Union was Bonn 1913)  
Jeans's U is  $10^{12}$  yr old
- 1920 Kapteyn Universe (d. 1922), Eddington says stars live on  
subatomic energy (radioactivity as E source had already  
turned up at discussion before Kelvin's death)
- 1921 Curti-Shapley Debate; 1922 Friedmann soln, Opik d to M31  
Kulik to Tunguska

## SOME ODD NOBEL PRIZES IN PERIOD

- 1908 Physics, Lippman, color photography from interference
- 1910 Peace, Permanent International Peace Bureau
- 1914-16 Peace - none
- 1917 Peace - International Red Cross
- 1919 Peace - Woodrow Wilson
- 1913 Peace, Lafontaine Pres of Perm Int. Peace Bureau
- 1920 Peace - Bourgeois, drafter of framework for League of Nations
- 1922 Peace - Nansen of passports (M Schwarzschild fellowship)
- 1925 Peace - Austen Chamberlain, Locarno Pact,  
Charles Dawes mitigated German reparations
- 1939-43 no prizes; 1944 Red Cross again
- 1912 Physics - Dalen (SW) regulator for lighthouses
- 1920 Physics - Guillaume, anomalies in nickel steel alloys
- 1926 Perrin ( yeah, same guy) sedimentation equilibrium

## SOCIETY/INTERNATIONAL ETC IN PERIOD

- 1908 First Model T Ford; Taft elected
- 1909 Peary \* Hansen (black) reach N Pole  
Young Turks revolution
- 1910 Death of Edward VII, Bwoegre V (cousin of both  
Czr Nicholas II and Kaiser Wilhelm II) becomes king
- 1911 Turkish-Italian War, first military offensive use of  
aircraft; Italy takes Liby & Tripoli  
Sun Yat Sen becomes Pres. of Chiha; Madera of Mexico  
Churchill First Lord of the Admiralty
- 1912 Wilson elected; first Balkan War
- 1913 Last time Wm. II, George V, and Nicholas II together  
(wedding of WM II's daughter to Duke of Brunswick)  
Rite of Spring; Armory Show  
FDR Asst. Sec. of Navy
- 1914 Lemaitre and R. Minkowski both on active duty (W and E  
fronts, and for the duration). Belgian colleagues  
say Lemaitre had intended priesthood before War  
(Schroedinger on Italian-Austrian front later)
- 1915 Hitler receives his first Iron Cross 2nd class  
Germans use chlorine at Ypres, April (their 4th try  
at gas; advice from Haber) Phosgene in December  
Anthony Eden (of bombing of Suez Canal while PM) serves

- 1915 Lusitania sunk with Americans aboard (no whole weapons, but pieces) in sight of coast; rescues botched
- 1916 Wilson re-elected; First US congresswoman  
Battles of Verdun & Somme  
Blackett & future George VI at Jutland
- 1917 Russia out; US in; Balfour Declaration (Chaim Weizmann)  
Geo. V refuses assylum to Nich. II & family  
Germany uses mustard gas
- 1918 Hitler award Iron Cross First Class (Wallerstein's uncle's story).  
Wm. II abdicates; Nich. II shot  
US making phosgene, chloropicrin & mustard gas  
Gas responsible for 1.32 % of Battle deaths (larger fraction of injuries; Hitler probably gassed)  
Poland resuscitated; Armistace 11/11  
Spanish flu begins killing 20,000,000 or so vs 9M war
- 1919 Treaty of Versailles forbids poisonous liquids & gases in German (and MUCH else); Weimbar Constitution  
Allied gas attacks on Soviet Russia  
Gandhi begins satya graha
- 1920 Treaty of Trianon Hungarian Borders; Harding elected  
First League of Nations meeting, KDKA licensed  
Estonia independent; Iraq Br. mandate  
First transcontintnall airmail=

- 1919 Treaty of St. Germain sets borders of Austria
- 1921 Washington conference forbids gas in war (indeed little in WWII)  
German runaway inflation; Reza Kahn to power in Iran
- 1922 German-Russian Treaty of Rapallo  
Japan leaves Vladivostok; Ireland independent  
Ataturk overthrows Sultan; Mousolini takes Rome  
Washington Naval Treaty limits sizes of ships; guns;  
Lexington becomes aircraft carrier
- 1923 France & Belgium occupy Ruhr to collect reparations  
Treaty of Lausanne draws Turkish borders  
Palestine become British mandates; lots of Japanese  
mandates over former German islands (Syria & Lebanon  
French mandates

combination, one part of hydrogen being taken as the standard. The following table contains a list of the elements with their atomic weights and symbols (the latter being explained in a succeeding paragraph). The list given was adopted in the autumn of 1910 by the International Committee on Atomic Weights.

Nb -	Aluminium...Al	27.1	Neodymium...Nd	144.3
	Antimony....Sb	120.2	Neon.....Ne	20.2
	Argon.....A	39.88	Nickel.....Ni	58.68
	Arsenic.....As	74.96	Nitrogen.....N	14.01
	Barium.....Ba	187.37	Osmium.....Os	190.9
	Bismuth.....Bi	208.0	Oxygen.....O	16.0
	Boron.....B	11.0	Palladium....Pd	106.7
	Bromine.....Br	79.92	Phosphorus...P	31.04
	Cadmium....Cd	112.40	Platinum....Pt	195.2
	Cæsium.....Cs	182.81	Potassium....K	39.10
	Calcium.....Ca	40.09	Praseodymi- um.....Pr	140.6
	Carbon.....C	12.0	Radium.....Ra	226.4
	Cerium.....Ce	140.25	Rhodium.....Rh	102.9
	Chlorine.....Cl	35.46	Rubidium....Rb	85.45
	Chromium....Cr	52.0	Ruthenium...Ru	101.7
	Cobalt.....Co	58.97	Samarium....Sa	150.4
	Columbium...Cb	93.5	Scandium....Sc	44.1
	Copper.....Cu	63.57	Selenium....Se	79.2
	Dysprosium..Dy	162.5	Silicon.....Si	28.3
	Erbium.....E	167.4	Silver.....Ag	107.88
	Europium....Eu	152.0	Sodium.....Na	23.0
	Fluorine.....F	19.0	Strontium....Sr	87.63
	Gadolinium...Gd	157.3	Sulphur.....S	32.07
	Gallium.....Ga	69.9	Tantalum ....Ta	181.0
	Germanium...Ge	72.5	Tellurium....Te	127.5
	Glucinium....Gh	9.1	Terbium....Tb	159.2
	Gold.....Au	197.2	Thallium....Tl	204.0
	Helium.....He	3.99	Thorium.....Th	232.4
	Hydrogen....H	1.008	Thulium.....Tm	168.5
	Indium.....In	114.8	Tin .....Sn	119.0
	Iodine.....I	126.92	Titanium....Ti	48.1
	Iridium....Ir	193.1	Tungsten....W	184.0
	Iron.....Fe	55.85	Uranium.....U	238.5
	Krypton.....Kr	82.92	Vanadium....V	51.06
	Lanthanum..La	139.0	Xenon.....Xe	130.2
	Lead.....Pb	207.1	Ytterbium....Yb	
	Lithium.....Li	6.94	(Neoytterbium) Yb	
	Lutecium ...Lu	174.0	172.0	
	Magnesium...Mg	24.32	Yttrium.....Yt	89.0
	Manganese....Mn	54.93	Zinc.....Zn	65.37
	Mercury.....Hg	200.0	Zirconium....Zr	90.6
	Molybdenum..Mo	96.0		

Winistor; Comma latice  
Ency. 1914 83 elements

MISSING: Ho Hf Tc Pm  
U Th Ra decay products  
Sorting of R.E. - Moseley +  
1913-14 ff.

↓  
Gallipoli 1915

Met. Beob. an der k. k. Sternwarte in Krakau  
im Monate August 1914.

Tag	Windesrichtung und Geschwindigkeit in Kilometern pro Stunde $ha = 21.2\text{ m.}$				mittlere Geschw.	Niederschlag in mm $7^h$	$h_r =$ $0.7\text{ m}$	Insolation <sup>1)</sup>
	7 <sup>h</sup>	2 <sup>h</sup>	9 <sup>h</sup>					
1	WNW 9	NW 19	WSW 7	9.9				50.1
2	W 3	N 3	ENE 4	3.4				55.1
3	WSW 4	W 18	— 0	8.5				56.3
4	E 1	NE 6	WNW 2	4.8		0.11	DD D	59.4
5	N 7	WSW 10	WNW 4	7.6	27.20	0		51.9
6	NW 1	SSE 6	ENE 8	4.4	20.60	D	0	57.0
7	WNW 15	NW 19	WNW 1	14.2				52.9
8	— 0	WNW 7	WNW 9	4.9	3.65	D	0	42.1
9	NNW 9	NW 9	NNE 2	5.8				56.8
10	— 0	E 4	ENE 1	2.4				52.8
11	— 0	SE 6	— 0	2.1				55.1
12	W 8	NW 15	NNW 1	0	8.1			57.1
13	— 0	N 15	NNW 7	5.0				55.9
14	W 3	WNW 10	WNW 4	6.7				56.3
15	W 1	WSW 14	WNW 6	6.3	0.23	DD DD	A A	45.1
16	W 3	W 7	N 4	4.5				56.0
17	E 3	E 10	NE 9	7.7	4.61	D	0	27.7
18	NNE 6	E 7	— 0	5.5	0.65	D	0	27.1
19	WSW 4	W 1	WNW 6	4.8	4.66	D	0	50.0
20	WNW 6	WSW 14	W 1	8.5				53.6
21	NE 1	ENE 13	NE 8	7.3				49.9
22	ENE 6	ENE 10	NE 8	7.0				50.3
23	WSW 8	W 10	WNW 7	6.5				50.0
24	W 7	NE 2	NNW 4	4.3				53.0
25	WSW 3	ENE 4	NE 1	2.1				57.2
26	— 0	SSW 4	E 4	2.4				54.4
27	— 0	ENE 6	ENE 3	3.2				56.5
28	— 0	ENE 9	NE 4	4.5	0.05	DD DD	0	55.3
29	NE 1	NE 10	NNE 4	5.5				55.9
30	— 0	ENE 4	— 0	1.8				54.1
31	W 7	W 16	N 9	8.0	1.23	D	0	50.2
M.	— 3.7	— 9.3	— 8.9	5.7	—			51.8

Windverteilung

N	NE	E	SE	S	SW	W	NW	Windstille
8.0	17.0	11.5	1.5	1.0	4.5	23.5	13.0	13

Maximum der Windgeschwindigkeit: 27 Kilometer in der Stunde am 5. zwischen 8<sup>h</sup>—9<sup>h</sup> a. m. bei N.

Niederschlagshöhe: in 18.6 m. Höhe 55.61 mm, in 0.7 m. Höhe 62.99 mm.

<sup>1)</sup> Schwarzkugelthermometer im Vakuum.

ANMERKUNGEN: 4. Nach 9<sup>h</sup> p. m. Regen. — 5. Von 7<sup>h</sup>—10<sup>h</sup> a. m. Regen, zwischen 8—9 Regenguss, Gewitter in d. Ferne. — 6. Von 6<sup>h</sup> 50<sup>m</sup> p. m. Regen. — 8. Von 4<sup>h</sup> 20<sup>m</sup> bis 6<sup>h</sup> p. m. u. nachts kl. Regen. — 10. Mrgs Bodennebel. — 12. Nebelig; nichts Weiterleuchten (SE). — 13. Nichts Weiterleuchten (SE). — 15. Nichts regnerisch. — 17. Von 10<sup>h</sup> a. m. bis 3<sup>h</sup> p. m. spät in d. Nacht Regen. — 18. Nach 10<sup>h</sup> p. m. u. später in d. Nacht Regen. — 19. Zwischen 11<sup>h</sup> a. m. u. 1<sup>h</sup> p. m. Gewitter meistens in d. Ferne. — 20. Um 4<sup>h</sup> 20<sup>m</sup> p. m. Regentropfen. — 23. Nebelig. ca. 5<sup>h</sup> p. m. Regentropfen. — 25. Mrgs Bodennebel. — 28. Um 5<sup>h</sup> u. nach 8<sup>h</sup> p. m. kl. Regen. — 31. Gegen Mitternacht Regen.

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SANTA BARBARA

POT-SHOTS NO.3253.



Ashleigh  
Brilliant

# YOU CAN GET A GREAT REPUTATION FOR WISDOM

JUST BY  
TELLING PEOPLE  
WHAT THEY ALREADY KNOW.

## A THREE-DIMENSIONAL GRID OF IMPACTS

X axis: Time frame: before, during, after

Y axis: Disciplines: chemistry, astronomy, physics, other

Z axis: Entities affected:  
individual people  
groups of people  
international structures (etc.)  
physical infrastructure  
skills & products  
scale-ups  
Central Powers vs. Allies vs. neutrals  
national organizations etc.

That is, a 3X4X7 (or more) data cube

none of the 84 boxes empty, some fuller than others

Famous scientists who served & survived very numerous; those  
who died less numerous (age effect, but Moseley & K.  
Schwarzschild)

ABOUT POISON GASES (Cl, mustard gas,  $C_4H_8Cl_2S$  =  
dichlorethyl sulfide, tear gas)

about 90,000 deaths out of 9 million

22/4/15 German Cl at Ypres (town)

22/9/15 British Cl at Loos

July-Nov<sup>e</sup> German mustard gas at Passchendaele(village) 1917

Rutherford never forgave Haber

Further development led to gases used in WWII camps

Violation of Hague Convention removed barriers (US  
defoliants in Vietnam and all)

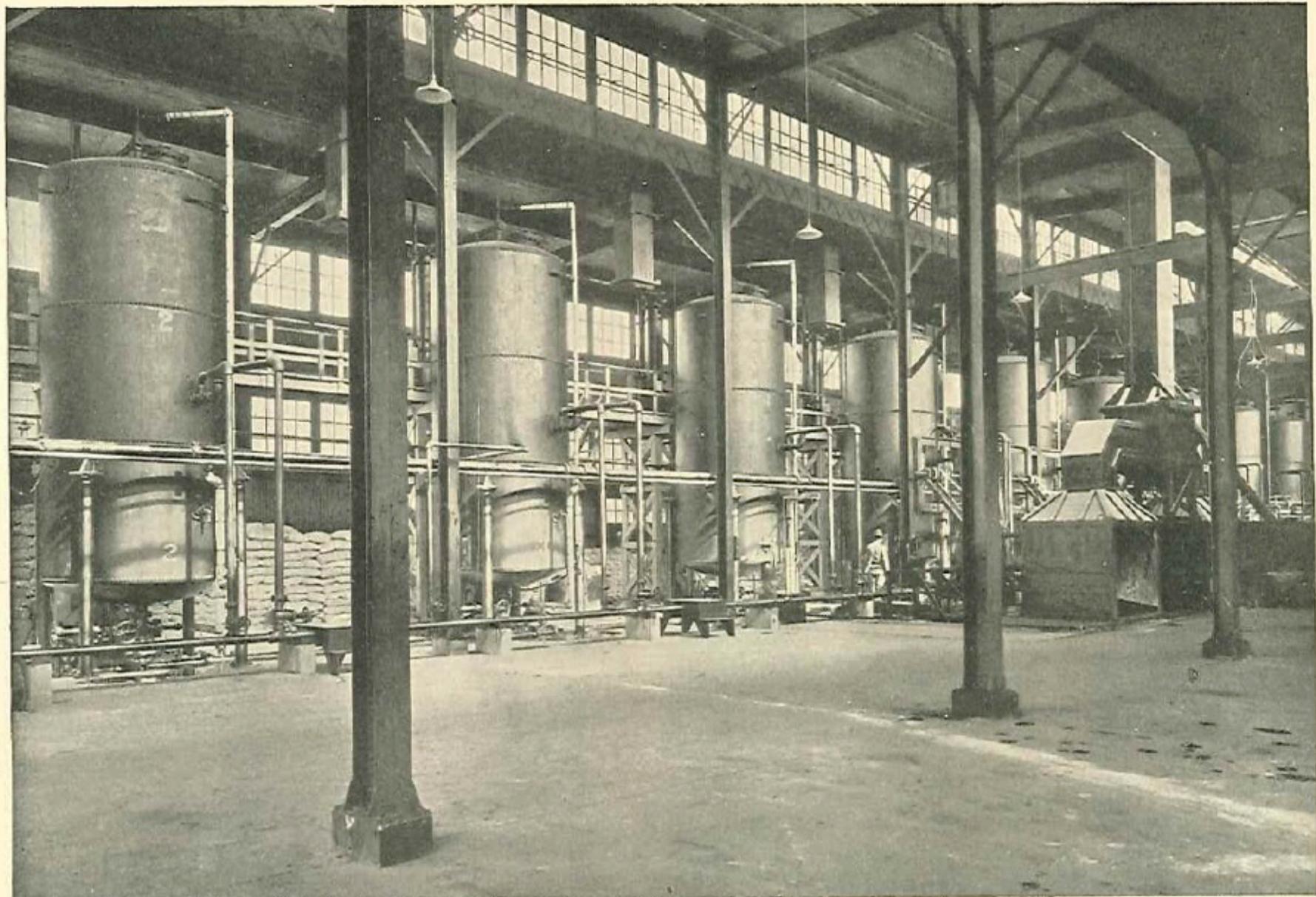
Definitely not decisive in the war nor in many battles  
compared to barbed wire and tanks

Others: phosgene ( $COCl_2$ ), chlorpicrin ( $CCl_3NO_2$ ), compounds  
of Br, As, CN, "Lewisite"

Capt AT Mahan had objected in 1899 at Hague to banning gases  
(UK ditto)



Early gas masks, here worn by Russian officers.



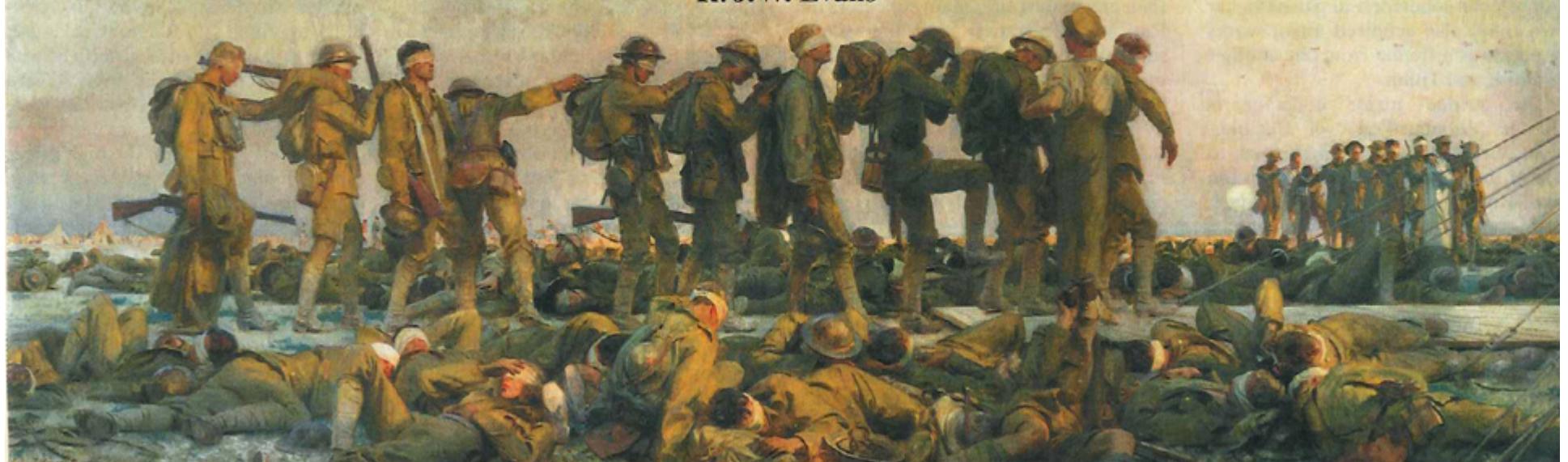
From "America's Munitions"

#### THE CHLORPICRIN PLANT AT THE EDGEWOOD ARSENAL

From these stills, filled with a mixture of bleaching powder, lime, and picric acid, the poisonous gas, chloropicrin, distills off.  
This plant produced 31 tons in one day.

# **'The Greatest Catastrophe the World Has Seen'**

R. J. W. Evans



*John Singer Sargent: Gassed, 1919*

BOX: CHEMISTRY - DURING

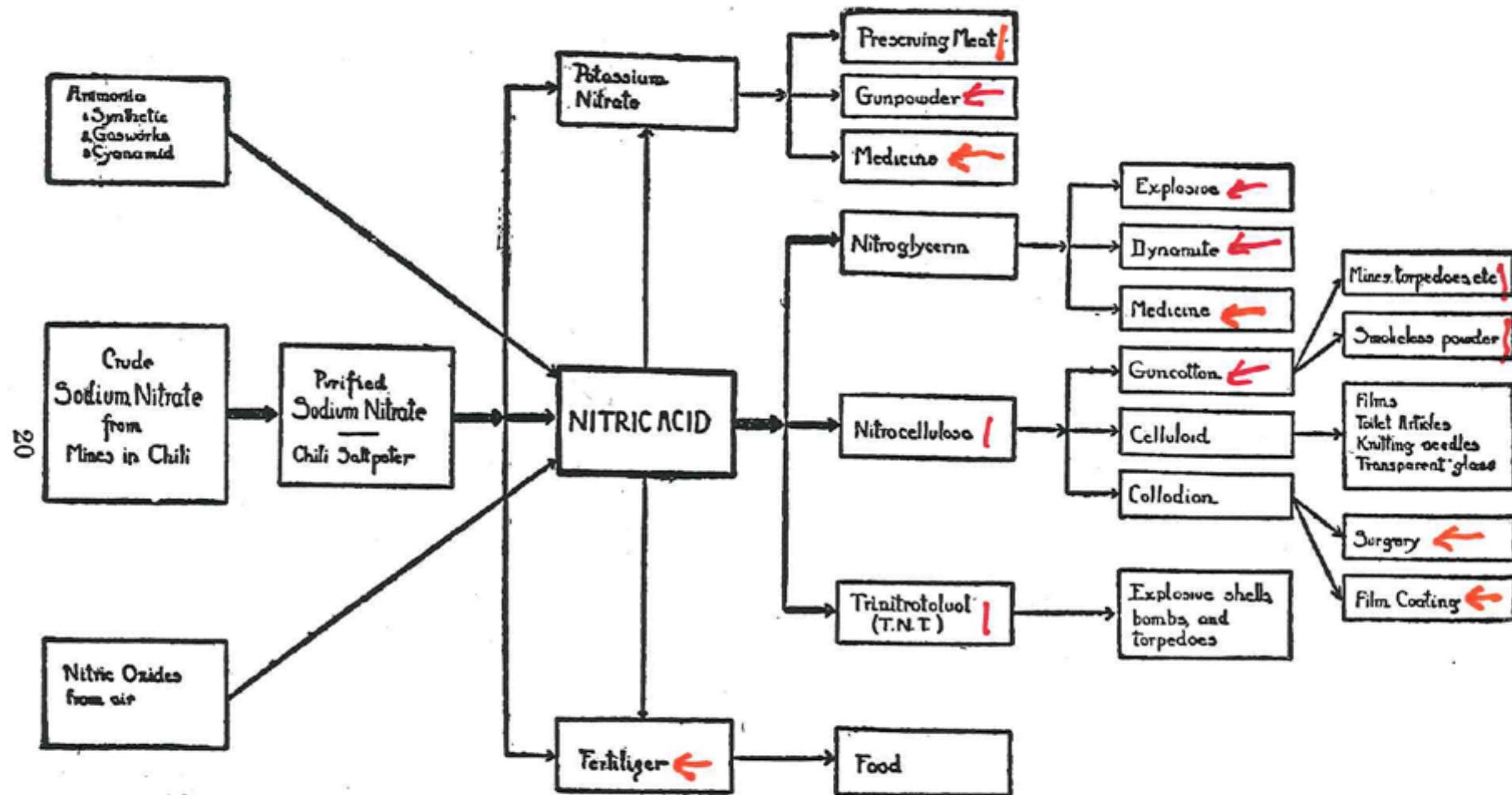
Central Powers	Allies
N fixation (Haber, arcs...)	optical glass (affected Lick, Mt. W etc)
synthetic rubber (gas masks)	dyestuffs (uniforms)
synthetic fuels	potash (fert. Germany) Urey toluene for TNT

BOX: ASTRONOMY - AFTER

Demise of Hale's International Solar Union (at 1910 meeting  
K. Schwarzschild suggested future = all of astronomy)  
Near-terminal slowing of Carte du Ciel (many Germ. zones)  
Astrophotography: war-driven (aerial reconnaissance) dicyanin-  
sensitized plates for red and near IR  
Shift of power to US (observatories at good sites, but also  
loss of people & facilities in Europe)

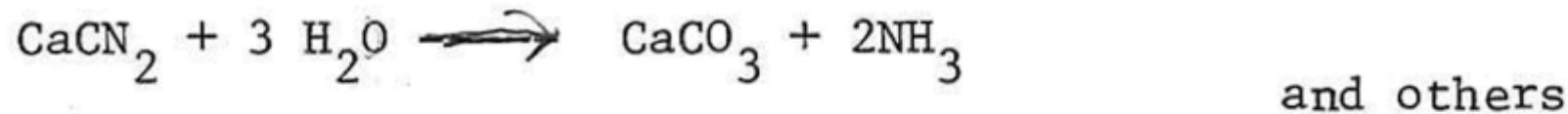
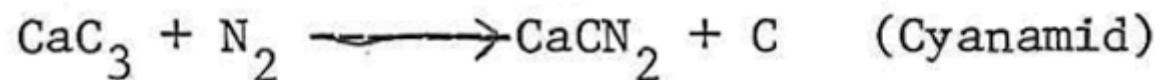
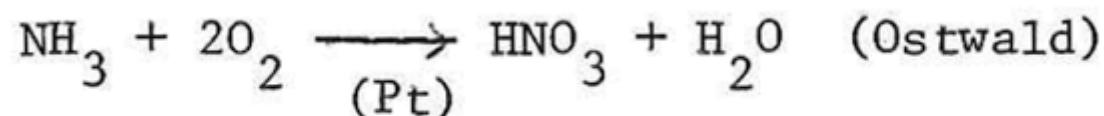
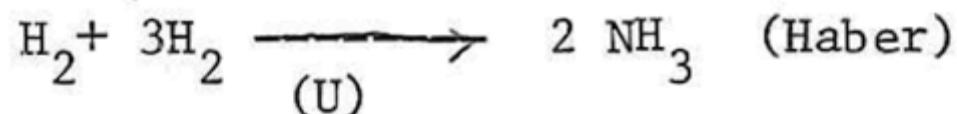
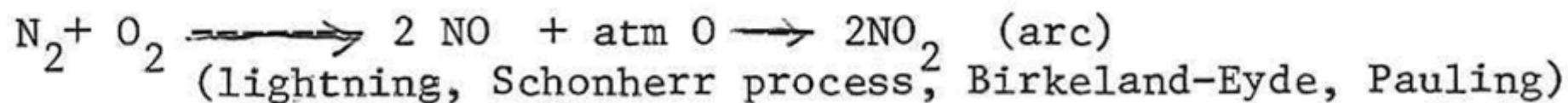
BOX: PHYSICS -- DURING

Work on general relativity, early quantum mechanics chugged  
along among those too old/wrong nationality to serve

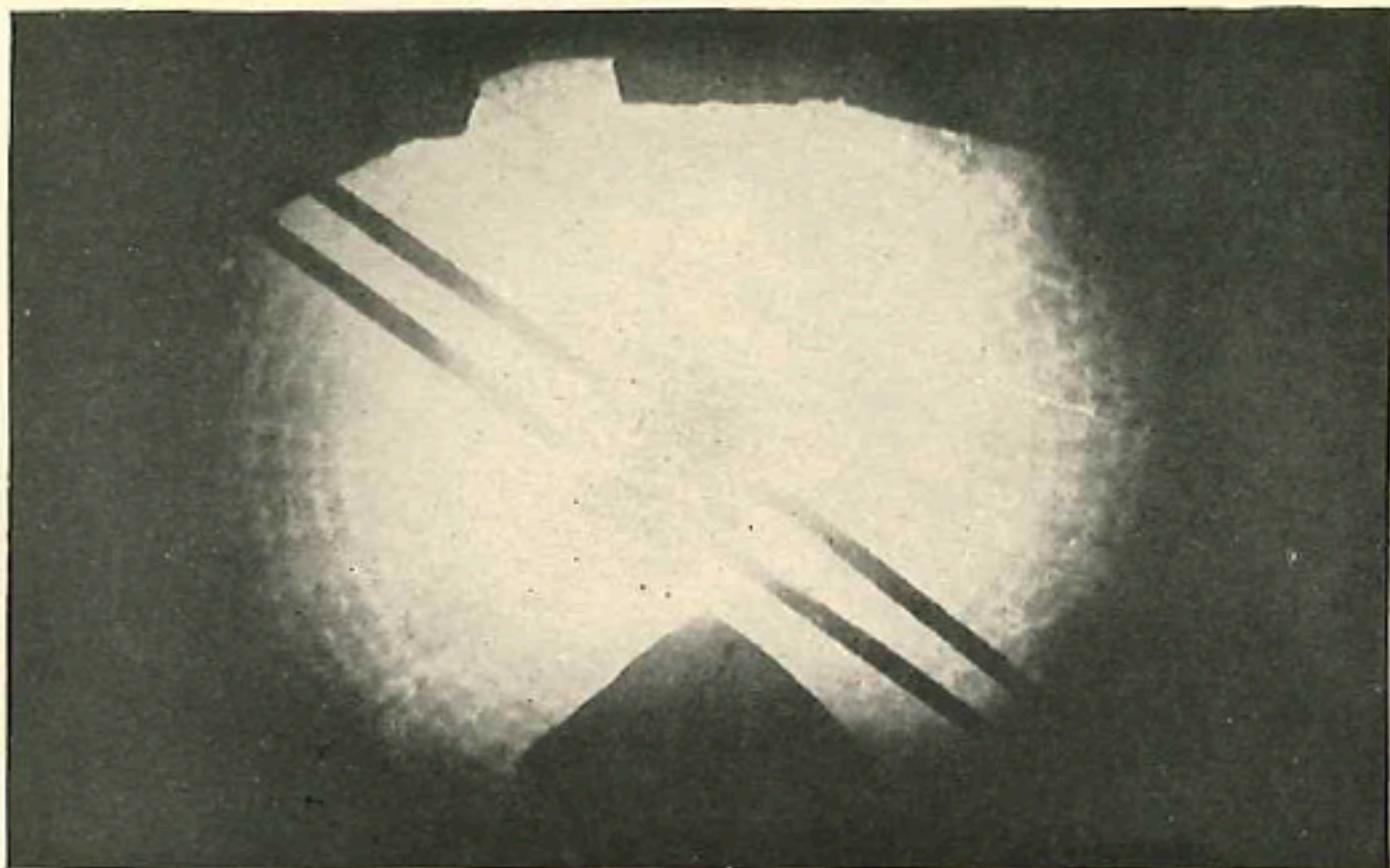


From W. G. Whitman's "The Story of Nitrates in the War,"  
*General Science Quarterly*

## NITROGEN FIXATION



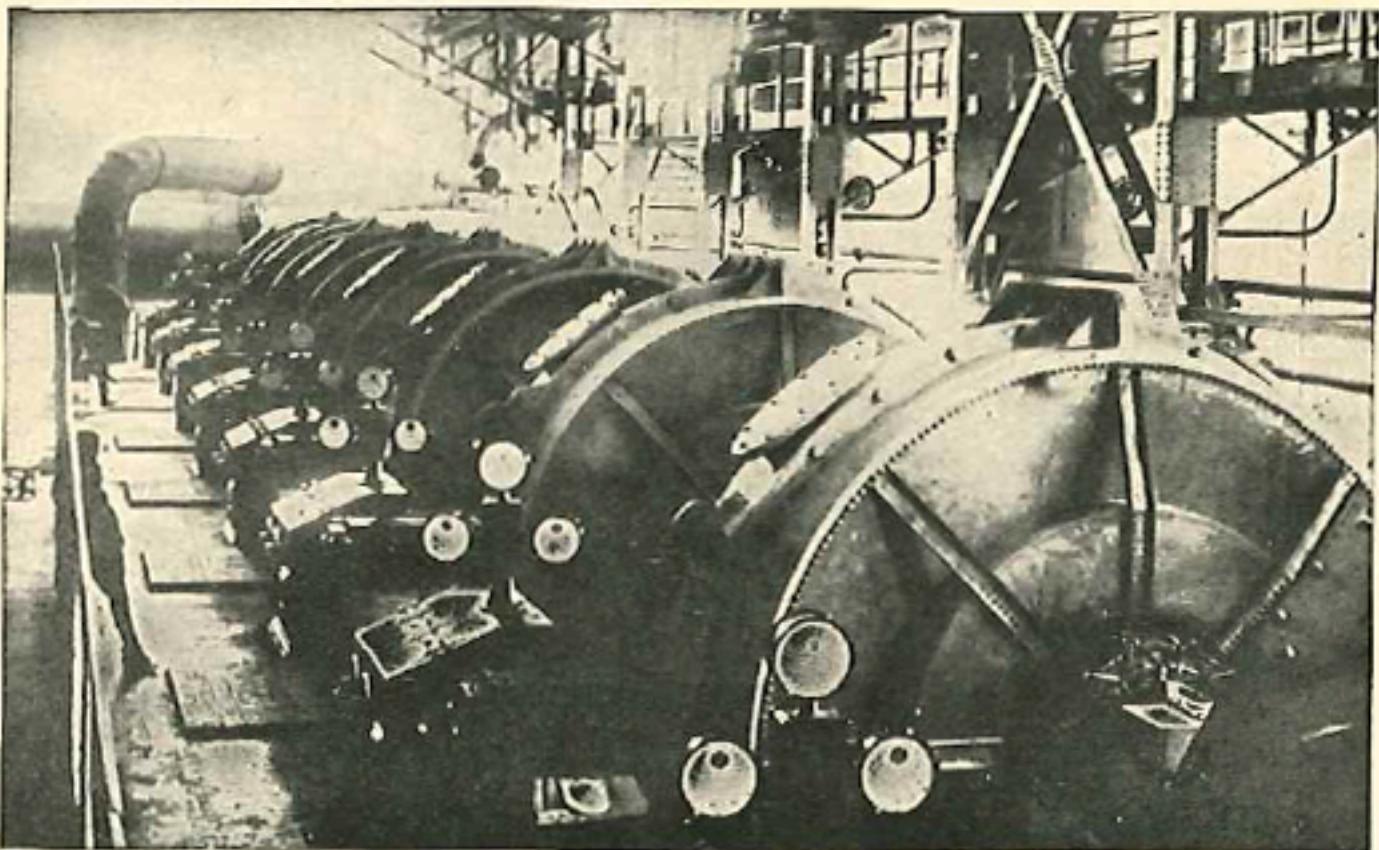
Postwar, German chemical patents to Allied Property Custodian  
(also Jahrsberichte) to Chemical Foundation (4500)



Courtesy of E. I. du Pont de Nemours Co.

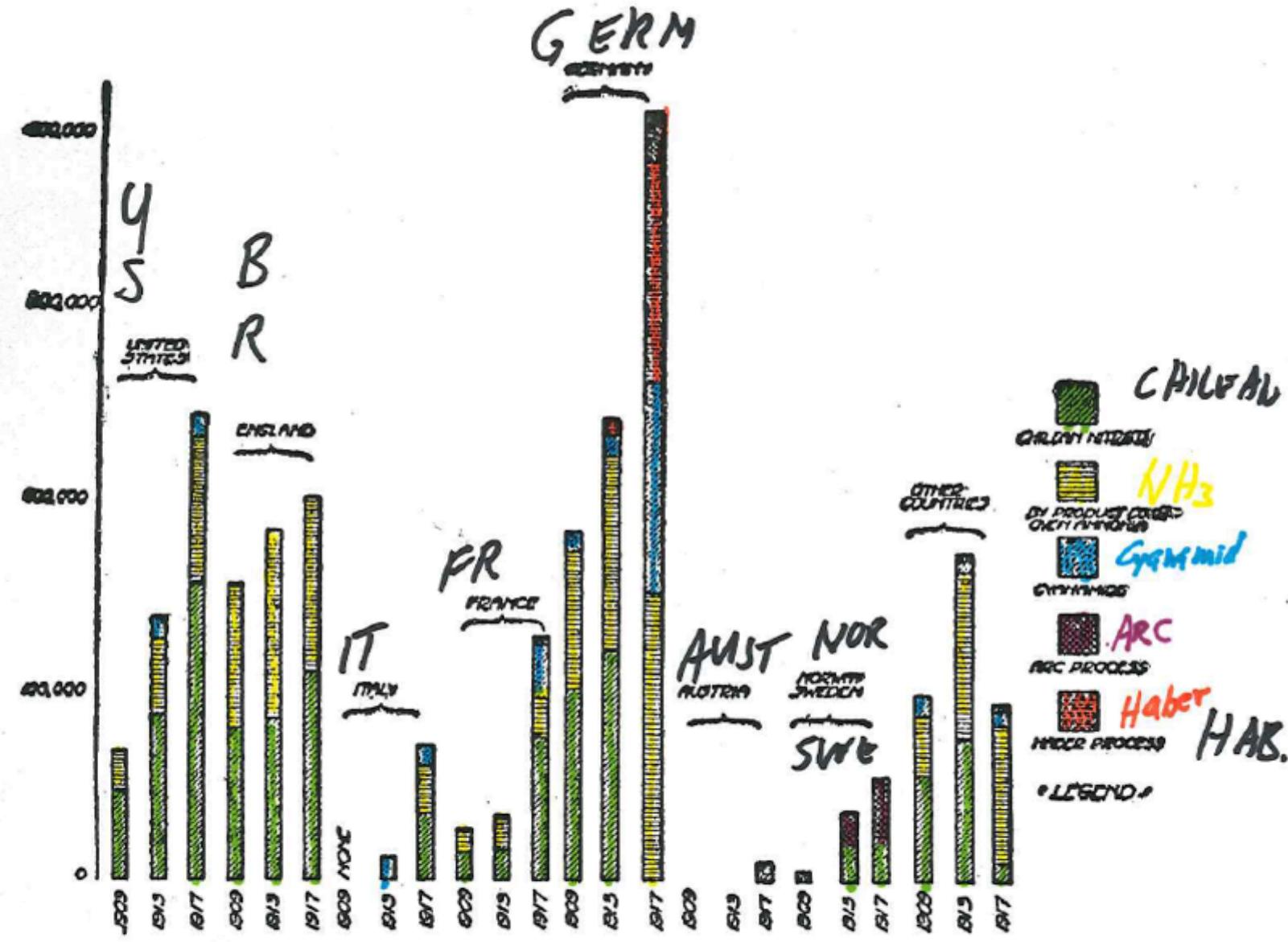
**BURNING AIR IN A BIRKELAND-EYDE FURNACE AT THE DU PONT PLANT**

An electric arc consuming about 4000 horse-power of energy is passing between the U-shaped electrodes which are made of copper tube cooled by an internal current of water. On the sides of the chamber are seen the openings through which the air passes impinging directly on both sides of the surface of the disk of flame. This flame is approximately seven feet in diameter and appears to be continuous although an alternating current of fifty cycles a second is used. The electric arc is spread into this disk flame by the repellent power of an electro-magnet the pointed pole of which is seen at the bottom of the picture. Under this intense heat a part of the nitrogen and oxygen of the air combine to form oxides of nitrogen which when dissolved in water form the nitric acid used in explosives.



Courtesy of E. I. du Pont de Nemours Co.

A BATTERY OF BIRKELAND-EYDE FURNACES FOR THE FIXATION OF  
NITROGEN AT THE DU PONT PLANT



World production and consumption of fixed inorganic nitrogen expressed in tons nitrogen

From *The Journal of Industrial and Engineering Chemistry*, March, 1919.

PRODUCTION OF POTASH IN THE UNITED STATES

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POT-SHOTS NO. 3581.

Ashleigh  
Brilliant  
SANTA BARBARA

IT'S AMAZING  
HOW MUCH RESEARCH  
HAS GONE INTO MAKING

SOME OF THE  
WORST  
DECISIONS.

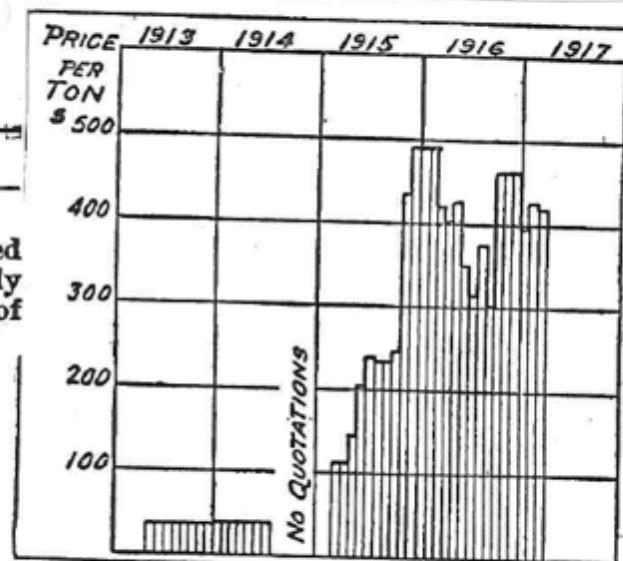


## PRODUCTION OF POTASH IN THE UNITED STATES

Source	1916		1917	
	Tons K <sub>2</sub> O	Per cent. of total production	Tons K <sub>2</sub> O	Per cent. of total production
<b>Mineral sources:</b>				
Natural brines.....	3,994	41.1	20,652	63.4
Alunite .....	1,850	19.0	2,402	7.3
Dust from cement mills .....			1,621	5.0
Dust from blast fur- naces .....			185	0.6
<b>Organic Sources:</b>				
Kelp .....	1,556	16.0	3,752	10.9
Molasses residue from distillers .....	1,845	19.0	2,846	8.8
Wood ashes .....	412	4.2	621	1.9
Waste liquors from beet-sugar refiner- ies .....			369	1.1
Miscellaneous indus- trial wastes .....	63	.7	305	1.0
Total .....	9,720	100.0	32,573	100.0

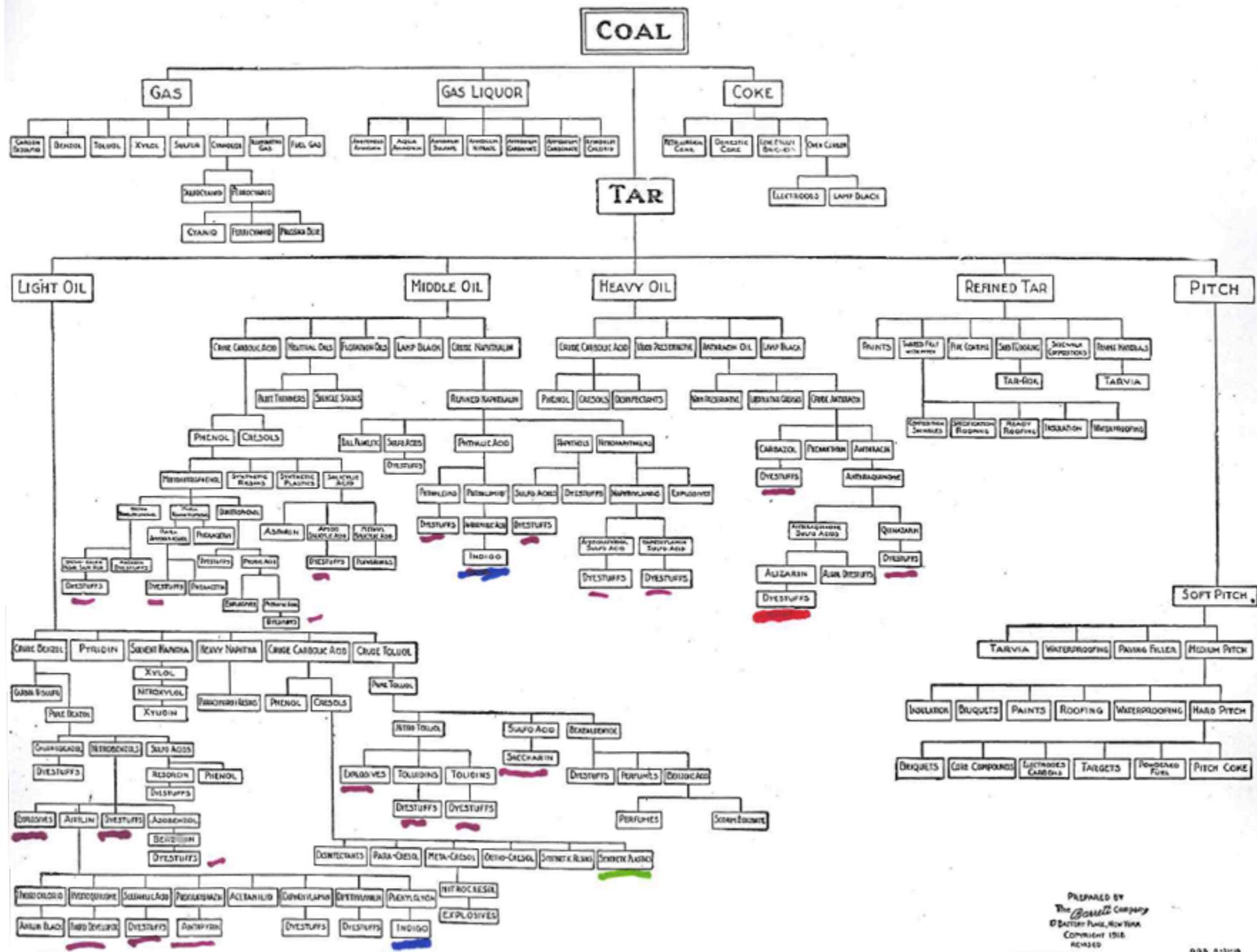
—From U. S. Bureau of Mines Report, 1918.

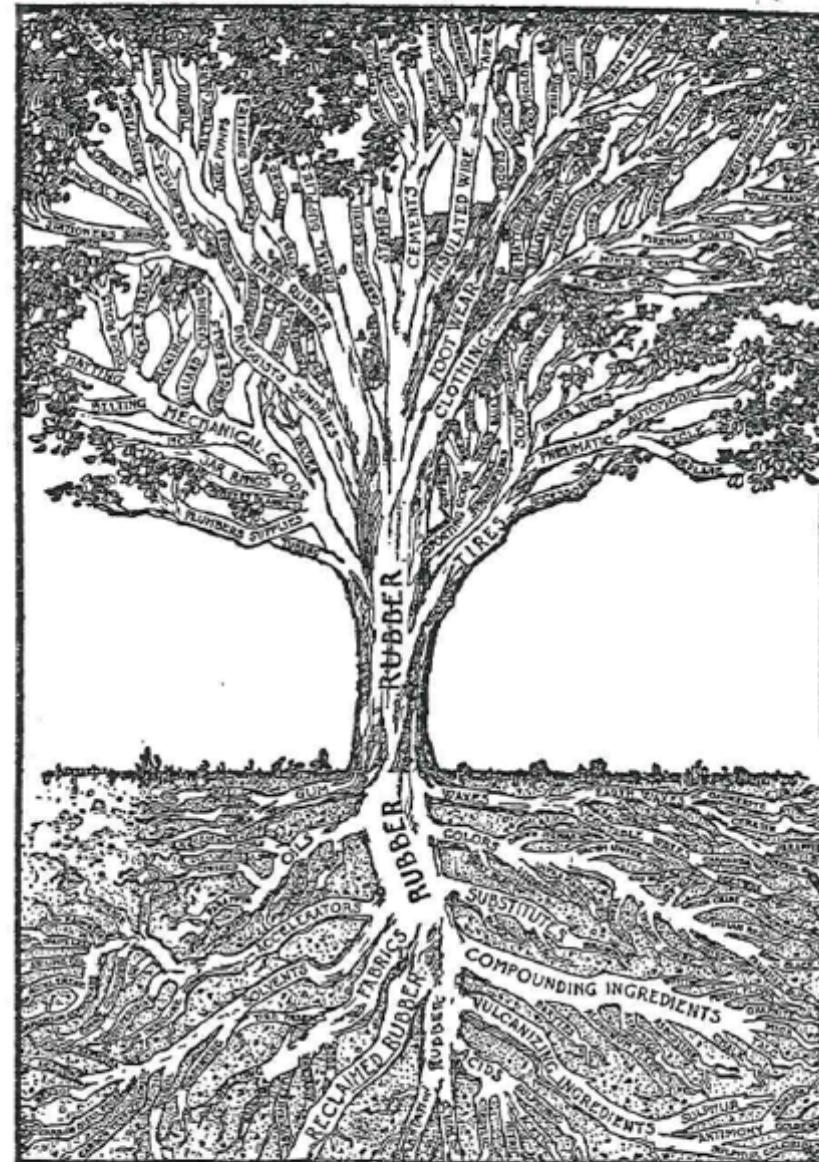
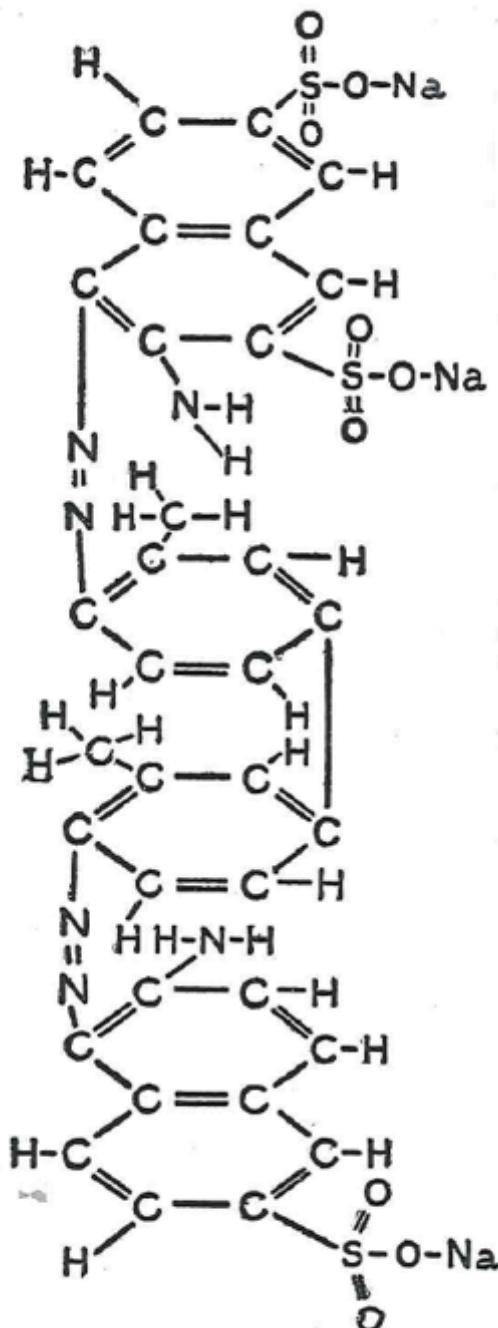
This table shows how inadequate was the reaction of the United States to the war demand for potassium salts. The minimum yearly requirements of the United States are estimated to be 250,000 tons of potash. 1919



What happened to potash when the war broke out. This diagram from the *Journal of Industrial and Engineering Chemistry* of July, 1917, shows how the supply of potassium muriate from Germany was shut off in 1914 and how its price rose.

# PRODUCTS DERIVED FROM COAL

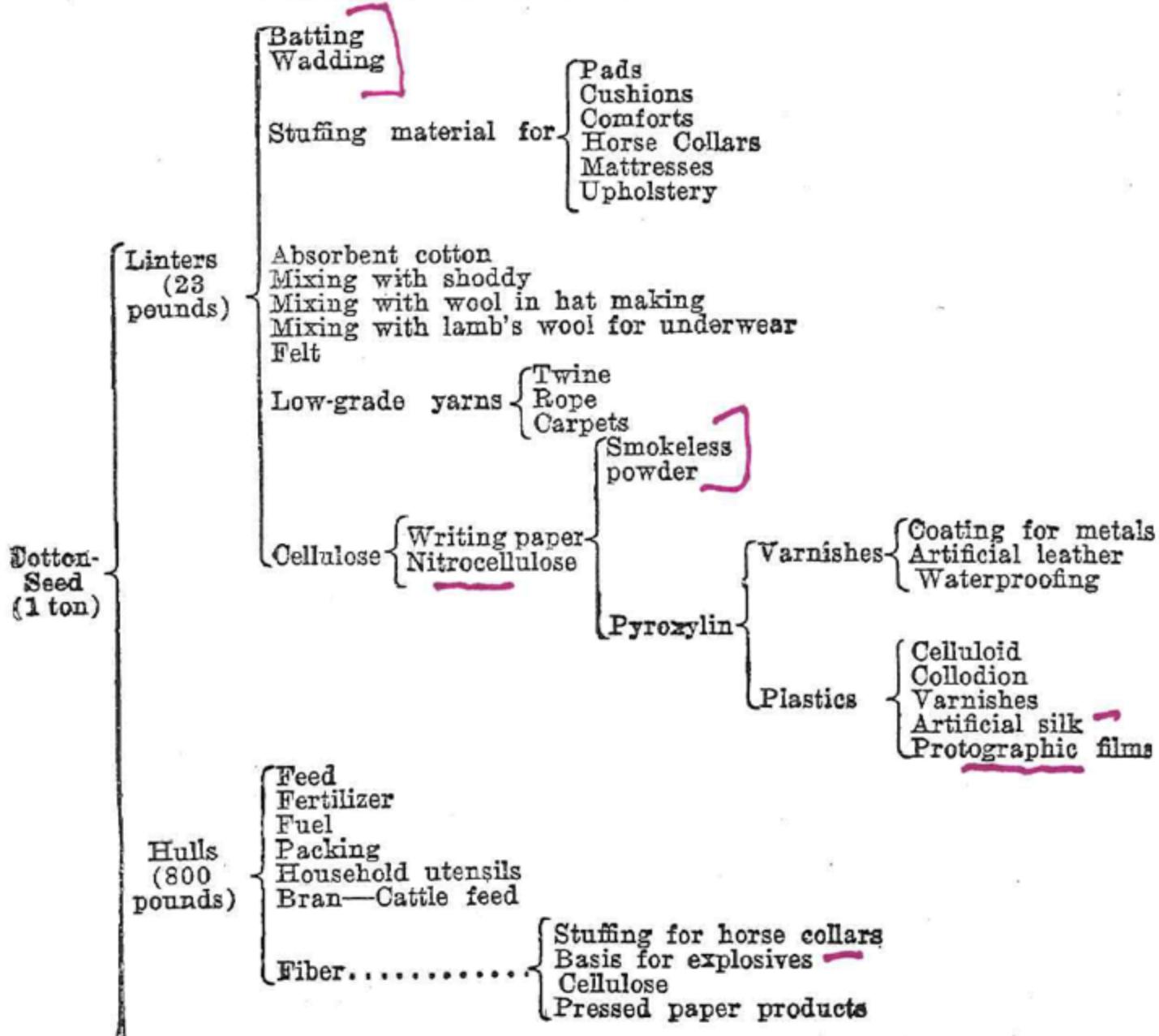




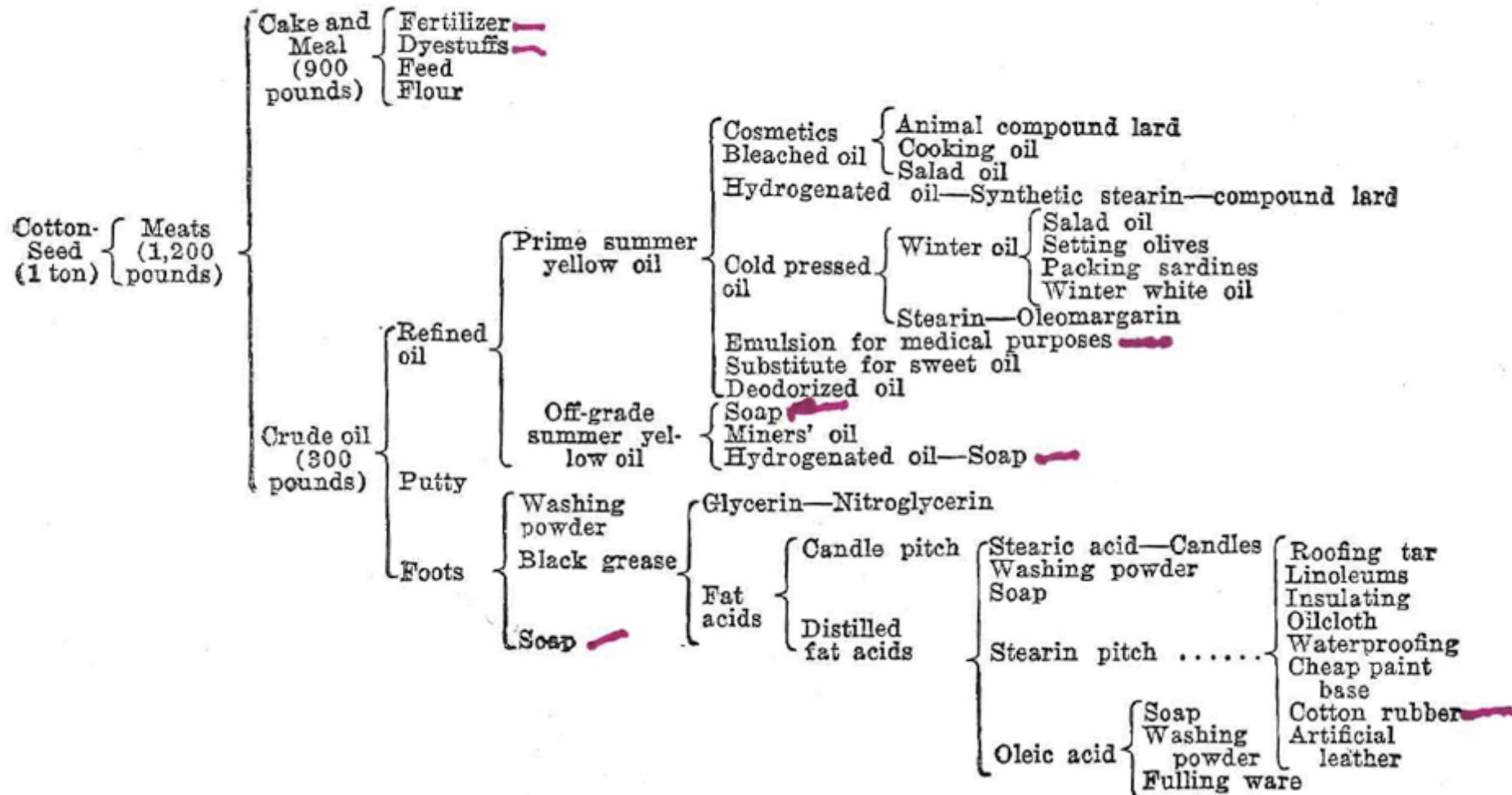
Courtesy of the "India Rubber World."

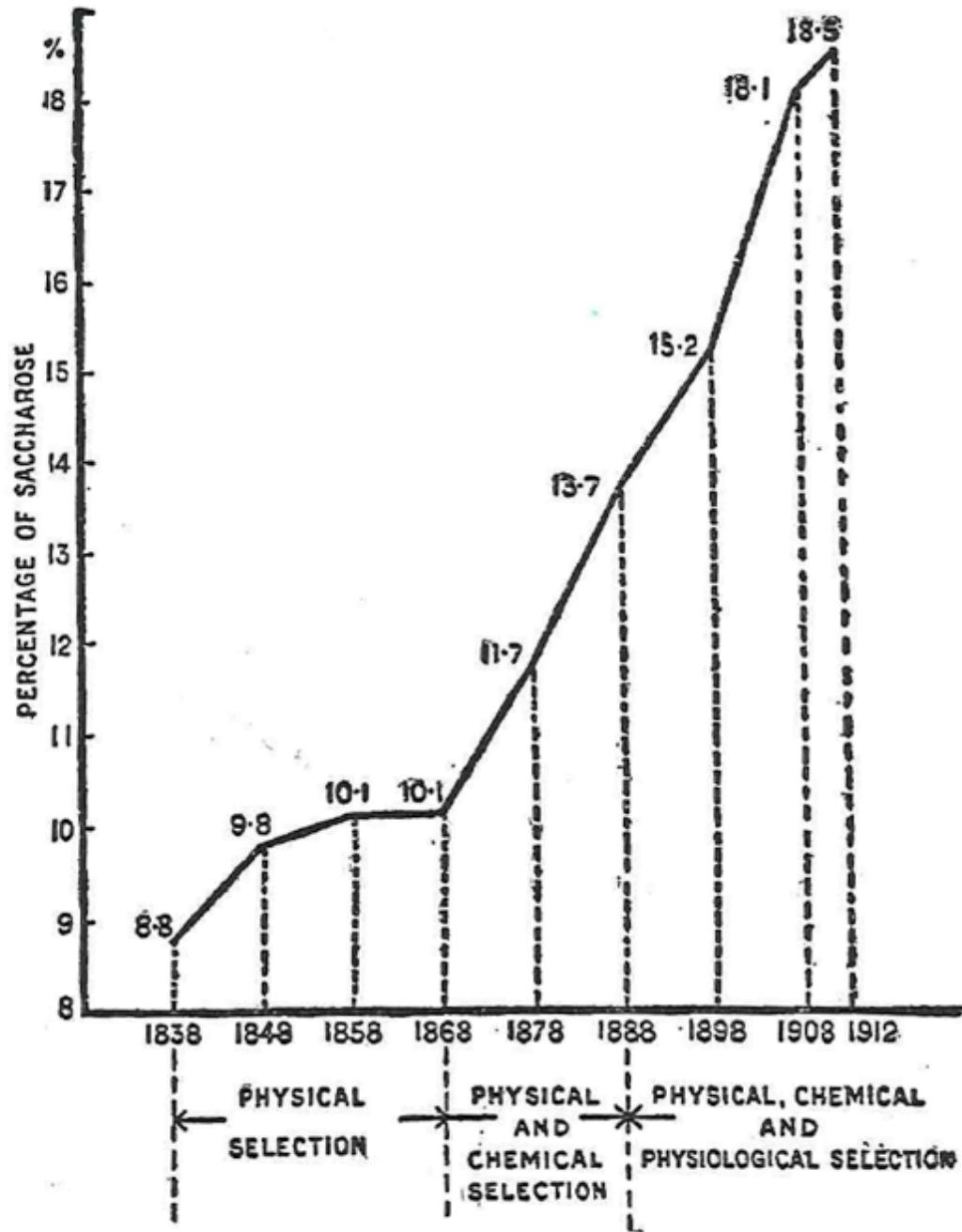
What goes into rubber and what is made out of it

## PRODUCTS AND USES OF COTTONSEED

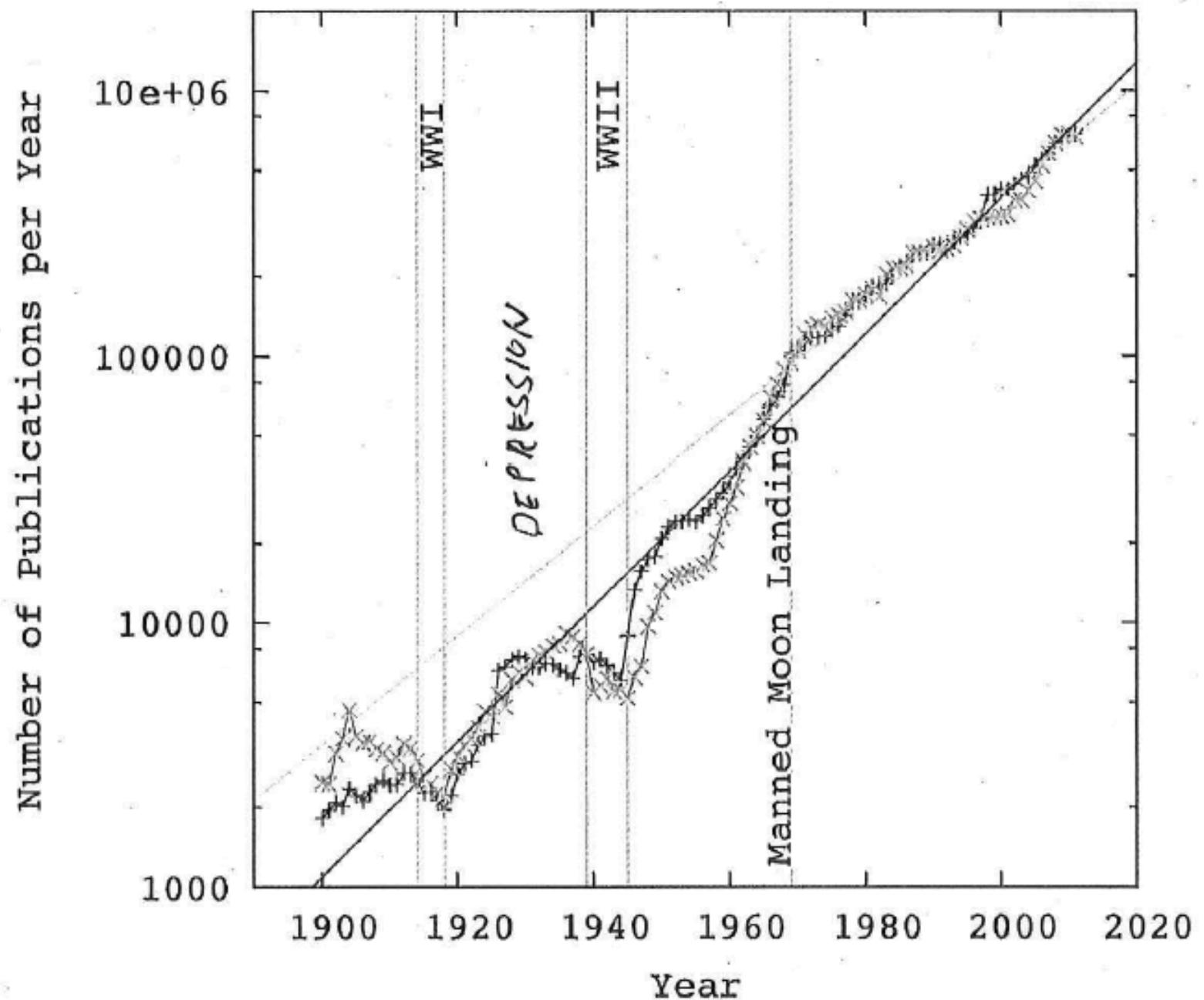


### PRODUCTS AND USES OF COTTONSEED—Continued





How the sugar beet has gained enormously in sugar content under chemical control



## PRE-GREAT WAR INTERNATIONAL COOPERATION

Gesellschaft Katalog, 1868

Carte du Ciel 1887 (like League of Nations, US kept out)

Int. Assoc. for Geodesy 1896

Int. Union for Co-operation in Solar Research 1904

Not just astronomy<sup>1</sup>

Pois et Measure in Paris

several international health organizations & standards  
from 1890s

International fairs & expositions

International conferences 1900-13

Paris - 426, London - 141, Brussels - 168, Berlin - 96

New York - 14, Oslo - 15 etc.

International art exhibits, music festivals

International Sanitary Convention 1892

International List of Causes of Death 1893



*Group photograph of the fifth and last Conference of the International Solar Union, held at Bonn from July 30 to August 5, 1913. It was the last fully international astronomical meeting before the First World War caused the chasm between the astronomers from the "Allied" and "Central" Powers. When this photograph was taken, the Executive Committee of the Solar Union consisted of A. Schuster, G.E. Hale, and K. Schwabe. The latter died during the war. The Solar Union ceased to exist at the war when Schuster and Hale decided to abolish it because its activities*

were taken over by the IAU. Among the participants in the left hand part of the photograph we note, seated in the front row, 6th from the left, F.W. Dyson and to his left B. Baillaud. In the right hand photograph, seated in the front row, 5th from the left W.W. Campbell, and to his left at the end of the row (probably) A.S. Eddington. All four of these would later become a President of the IAU. A list of the participants is given in Trans. Int. Solar Union, Vol. IV, p. 5, 1914.

(Collection Utrecht)

AN ASTRONOMICAL HISTORY OF THE GREAT WAR TO END ALL WARS

Beginning: 21 August 1914 eclipse, Erwin Freundlich led a  
an expedition from Berlin to observe eclipse from the  
Crimea and look for bending of light (at the 1/2 of GR  
value then proposed by Einstein). Captured, interned with  
all members; equipment never recovered. Other German  
expeditions retreated from Kiev, observed from Finland  
etc, but not bending of light.

End: 191 (a) UK eclipse expedition to Sobral & Principe  
under Eddington & Dyson (AR) found the bending. Einstein  
was then perceived as a "German physicist"

(b) Founding of the IAU in Brussels (after preliminary  
meetings in Paris & London fall 1918

28 July; de l'Heure to live in Paris, Telegrams in  
Copenhagen, officers & 32 standing committees (some of  
which continued right down to 2015, when all abolished)

Last fully international pre-war meeting 1913 July 30, Bonn,  
International Solar Union (exec comm A Schuster, Hale,  
K. Schwarzschild)

Born: Bebrich (Hessen), Germany, 29 May 1885  
Died: Wiesbaden, Hessen, (Germany),  
24 July 1964



Erwin. Reproduced by permission of D. B.  
from The International Portrait Catalogue of  
Archenhold Observatory (Berlin: Archenhold Obs.,

AUGUST 1914  
Eclipse expedition  
Crimea



ЭДДИНГТОН Артур Стэнли  
(28.XII 1882—22.XI 1944)

1919 Eclipse  
expedition



ВОЛЬФ Макс  
(21.VI 1863—3.X 1932)

Dry plates  
blink comparator etc  
NAS Gold Medal 1914  
(Einstein 1926)

## WHO WAS WHO

### "Central Powers"

Germany & Colonies  
Austria Hungary  
Ottoman Empire  
Bosnia  
Bulgaria

### Neutrals

Spain  
Switzerland  
Norway, Sweden, Denmark  
Netherlands  
Argentina  
Chile

Poland in abeyance

### "Allied States"

Belgium  
France & Colonies  
UK + Ireland & Colonies  
Japan  
Brazil  
Italy  
Portugal  
Russia  
Rumania  
Serbia  
Greece  
Montenegro  
Albania  
Italy  
Mexico

*USA late*

INDIVIDUAL ASTRONOMERS, MOSTLY FROM BEA 1st EDITION (Hockey et al. Eds)

Ainsley Fr 1869 Royal Navy 1894-1922, instructional branch  
 Anderson, John US 1876. micrometry & sonic submarine detection for Navy  
 Andoyer Fr 182, one son killed in WWI  
 Appleton Br 1892. Volunteer 1914 (also Wm. Bragg) Royal Engineers, instruction but also eavesdropping on radio communications(MET)  
 Astron Vr 1877 enhancing airplane fabric & webbing @ Royal Aircraft Estab. Farnsborough  
 Atkinson Br 1898 No? Rvbw  
 Bäckström Ger 1893. no. limped, 4f?  
 Baillaud Fr 1848 kept up time signal transmission from Eiffel Tower (was a founder of Carte du Ciel etc & of IAU)  
 Beyer, Max Ger 1894 served in both WW  
 Banachiewicz Poland 1882. nd(?)  
 Barnard US 1857 apparently got to France 1917 or so to speak at Paris acad sci, medal winner  
 Bigourdan Fr 1851. Time service of Paris observatory under Baillaud. Was often only astr. speaker at sessions of Paris Acad 1914-18  
 Björkness Nor 1862. Chair at Leipzig 1912-17  
 Blackett Br 1897 @Dartmouth Naval Lab 1914, commissioned as a midshipman, to Italy, battles of Falkland Islands & Jutland. Navy sent to Cambridge with 400 others for study; at end of war decided to stay there  
 Blaigg, Mary Br. 1858. carried for Belgian refugee, children during WWI, early F. IAU member  
 Blazhko Rus 1870 ????  
 Bobrovnikoff Rus 1896. Jr. officer in Russian army, later White army (I knew) (Bruch Ger 1905; father killed 1914, battle of Loda)  
 (Campbell, WW was on 1914. Lock eclipse expedition to Russia)  
 Chalonge Fr 1895 ???  
 Chapman Br 1888 exempt as essential to education at Cambridge, but returned to ROG timeservice to free H Spencer Jones for something else (not) ..  
 Charlier Sw 1892. Member of Board of Astron. Gesell. 1904-23  
 Coblenz US 1873 at NBS in charge of radiometry 1905-45  
 Comas Solà Sp 1868. Contributed observations regularly  
 Compton US 1892. 1917-18 @ Western Electric Company Westinghouse (one of many large companies that turned their research labs partly to war work)  
 Comrie NZ 1883. NZ Expeditionary Force in Fr, lost leg (WWII scientific computing services supported by military operations)  
 Cosserat Fr 1866 director @ Toulouse 1908 to death; completed their part of Carte du Ciel  
 Cowell India 1870. director of Nautical Almanac Office ROG 18-30  
 Crommelin N. Ireland 1865. At ROG  
 Curtis US 1872. "wartime duties" at Sandiego, Berkeley & Washington  
 Curtiss US 1880 teaching navigation at Detroit (and waiting impatiently for 24" lens from Jena for new telescope)  
 d'Azambuja Fr 1884. At Meudon under Deslandres  
 Denison Fr 1890 assigned to sound ranging service; lost one eye in combat in Campaign region croix de guerre & Legion d'Honneur 1915, under Escanglon  
 Delporte Belg 1892. Uncle, but ???  
 D'Ansinger Br 1844. MAJOR contributor of comets, meteors, etc to Nature astronom yeolumn  
 Dingle Br 1890????  
 Dufay 1896 Fr. enrolled in Fr army & wounded  
 Dyson Br 1868. Director ROG, said he lost 36 members of staff (not all dead I think) filled in with retired, conscience objectors, Belgian refugees, women  
 Dzieciulski Warsaw 1878 ???????  
 Eddington Br 1862, exempt as essential, then consc. objector, then planning 1919 expedition  
 Esclangon Fr 1876 location of enemy troops by triangulation on sound of artillery firing (gunfire from France could often be heard in England, letters to Nature)  
 Everett Shad Br 1864 director at Kodakanal & sent back many observations  
 Fabry Fr 1867 head of Physical Section of Service of Invention, recd. Leg. d'Hon  
 Fesenkov Ru 1889 ???  
 Fowler, A. Br 1868 ???  
 Fowler RH Br 1889 MA 1915 then enlisted Royal Marines, wounded at Gallipoli by Turkish gunfire to ordnance work on ballistics OBE 1918. brother killed Battle of the Somme

Fox US 1878 2nd Lt. Sp-Am War; WWI vol. major infantry, to 1st. col. asst. chief of staff of 7th infantry in France, recalled 1940 full col. w/ Army Electronics Training Center at Harvard  
 Freudlich Ge 1885 1914 eclipse exped from Berlin to Crimea for Aug 21 solar eclipse, captured & interned by Russians, traded for one of their guys "heart condition"  
 Friedmann Ru 1886 meteorologist; flew own observing plane 1917, aviation instructor & pilot  
 Gaposchkin Ru 1889. Called up 1917, served on Galician (Aust-Hun front) *Hausw Wtlu*  
 Gerasimovich Ru 1889. ?? 1914-17 gap in biography  
 Grubb, H. Br 1844 Ireland. 1914 civilian work on telescopes topped & factory moved from Dublin to St. Albans for security  
 Guthnick Ger 1879 ??  
 Hagiwara Jpn 1897 ??  
 Hale US 1868 persuaded Pres Wilson to establish NRD (Not in BEA) major role in founding IAU  
 Hay 1888 Scot. vol. medically unfit. comedian entertained WWII troops  
 Herschel, John Hr. So Af 1837, Col (retired)  
 Hertzsprung DK 1873 at Potsdam 1909-19  
 Hess Austria 1883, Inst for radium research  
 Hicks Br 1873 preparation of military maps OBE 1920 (remark - office work seems to have led to more honors of this sort than being under fire? modest statisticis)  
 Hirayama Jpn 1874 sent to US 1916 to work on nautical almanac  
 Hoffmeister Ger 1897 at Bamberg apparently as replacement for someone on service  
 Horne d'Arturo 1879 Trieste, vol. with Italian army to artillery captain (Trieste = A-H'then)  
 Hubble US 1889 vol. 1917 ; to France, too late for the shooting  
 Humason US 1891 —  
 Culbert US 1890 Signal Corps, to capt. Ives 1882 US, worked for military  
 Humphreys US 1862 weather bureau  
 Ingalls US 1898 "served"  
 Innes Scott 1861 at the Cape, lots of observations to Astr. Col.  
 Jackson Scot 1887, 1917 commissioned Royal Engineers to France as trigonometer survey officer  
 Jeans Br 1877 TB & heart problems  
 Jeffrey Engl 1891. war-related project @ Cavendish, turned his attention to fluid dynamics  
 Jonckheere Bel 1888 displaced to England 1914, optical service of Royal Arsenal  
 Joy US 1882... not  
 Kulizza 1885 Pol/Ger Privatdozent @ Konigsberg  
 Kienle Ger 1895 ??(try AN 97, 99)  
 Klein Sweden 1894 (neutral)  
 Kohlschütter Ger 1883 between MtW & Potsdam  
 Kolhorster 1897 Ger/Ru/Pol, measured atmospheric electricity from Turkey - *Pew U*  
 Kopff 1882 Ger. "military service"  
 Kulika Ru 1883. joined the army, served on "Western front" (odd?)  
 Lampland US 1873 at Lowell  
 Lemaitre Bel 1894 called to serve as artillery officer for which decorated  
 Lindblad Sweden 1895 in college  
 Lundmark Sweden 1889 student  
 Luyten Indonesia 1899 student *HWW*  
 Lyot Fr 1897 work on aerial & marine navigation aids for Fr army, with Perot  
 Maksutov Ru 1896, in 1914 was at Military Engineering College, fought  
 Malmquist Swedish 1893  
 Messinger (not BEA) was with Wolr @ Konigstuhl, killed @ Ypres  
 Maunder 1851 Br-recalled to ROG post retirement to maintains sunspot record  
 McMath 1891 US volunteer, quaker, pilot, civil engineer building airplaes for Army Signal Corps Air Service  
 Melotte Br 1880 ROG 1895-1948  
 Merrill US 1887, Bur of Standards 1916-18, sensitizing photoemulsions to red  
 Metcalf 1866 US front line pastor for YMCA 3rd Div, 7th Infantry @ Chateau Thierry & Marne, shell shock & mustard gas, Unitarian  
 Mikhailov Ru 1886, bio gap 1911-18  
 Milne Br 1896 ineligible for active service (eyesight) but antiaircraft ballistic research 1915-19  
 Mineur Fr 1899 army (WWII resistance, Vichy removed him from lab position)

Minkowski Ger 1895 Army 1914-18, lost professorship 1935 *know*  
 Minneart Bel 1893 taught at Ghent in Dutch early in Germ occupation (there had been pre-war  
     agitation for Dutch instruction) 1918 accused of collaboration, sentences in absentia to  
     15 yr penal servitude, went to US, did not serve it  
 Moore US 1878 Lick quaker  
 Moulton US 1872 major US army, ballistics @ Aberdeen MD  
 Neugebauer, O. Austria 1899, enlisted 1917, lt. of artillery, Italian front  
 Numeroff/Numerov Rus 1891, 1915-17 bio gap  
 Milankovic 1879 A-H ??  
 Nordman Switz 1881 but in Fr, sound ranging technique to locate Ger artillery, CdG, L d'H  
 O'Connell Br 1896 priest, Irish AJ 15, 349  
 Oliver US 1884 vol. disqual. Aberdeen under Moulton  
 Opik 1893 Estonia student & teacher, White Russian Army 1917 *know*  
 Pannekoek NL 1873 departed Ger back to NL 1914; dismissed from Amsterdam job 1942 by Germ  
 Pearce Can 1893 Army signal core officer 1915, wounded in France, major 1919  
 Pease US 1891 1918 chief draftsman, engineering sect of NRC  
 Peel UK 1891 Hampshire Regiment in India to major  
 Peltier US 1900 quit HS to take over farm when older brother to war  
 Perdrier Fr 1881 ????  
 Perrin Fr 1870 Engineering Corps, telesite meter  
 Pettit US 1889 drafted from Yerkes studies to Army Signal Corps, optical measurements at  
     JHU with Wood.  
 Pfund US 1875 @ JHU  
 Plaskett HE Can 1893 1st lt. Canada Field Artillery 1916-18 served in France  
 Plummer Br 1875 AR of Ireland  
 Poincare Pres of France, was cousin of "our" Poincare  
 Porter US 1871 optical work at US NBS & instructor @ MIT  
 Frazer Ger 1883 ??? at Berlin-Babelsberg (imprisoned 1936; released to emigrate)  
 Regener 1881 Ger/Pol 1915-18 battlefield as X-ray technician; 1917-18 with Haber on gas  
     warfare @ Kaiser W Inst. 1939 removed from post (wife Jewish) but stayed in Germany,  
     CRs on V2  
 Reinmuth Ger 1892 @ Konigstuhl  
 Rosenberg Ger 1879 Army service 1914-18, Prof @ Tuebingen from 1918, 1935 removed as  
     director @ Kiel, but was in US  
 Ross 1874 US physics of photography @ Eastman Kodak  
 Rossiter US 1886 teaching  
 Russell 1877 Army Aviation Service Bureau of Aircraft Production consulting engineer  
 Saha 1893 India, teaching  
 Sunford US 1883 Dudley Obs  
 Saunder US 1875 1918 in DC in Millikan's group for NRC  
 Schlesinger US 1871, 1917 briefly seornautical engineer for US signal corps  
 Schmidt, B 1879 Russian, no right forearm, exempt  
 Schmidt, O 1891 Rus ???  
 Schuster Ger 1852 helped form IRC (emig. to Br 1870)  
 Schwarzschild K GERM 1873. Military service 1893-94, PhD 1891, 1914 volunteered immediately  
     field weather station Belgium 1915, Belgium, France, Russia artillery stuff, invalided  
     home fro Rus 1916, died pemphigus (is at least partly autoimmune)  
 Schwassmann Germ 1870 ??  
 Schroedinger Aust 1887, artillery officer, battalion commander Italy, Hungary  
 Shain Rus 1882 "service in WW-I"  
 Shane US 1895 service 1917-18 (WWII stuff at Lick)  
 Shapley US 1885, no  
 de Sitter NL 1872, transmitted Einstein GR papers to Eddington  
 Slipher & Slipher US, both at Lowell (1875, 1883)  
 Slocum US 1873 1918-20 instructor nautical science Brown  
 Smart Br 1889 instructor-it @ Royal Naval College  
 Spencer Jones Br 1890 inspector of optical supplies for Ministry of Munitions  
 Stark Ger 1874 univ. spectroscopy, canal rays  
 Stevenson (whom RAL called "Old Steave") Br 1894 med. student & civil surgeon in  
     military hospital

Stewart US 1894 to Fr with 29th Engineers  
 Stern 1889 Pol/Cer "service"  
 Stoyko Rus 1894 Rus army 1916-18  
 Stratton Br 1881 to lt. col. Royal Corps of Signals (+ WWII) DSO, Cr de G, Ch L d'H  
 Stromgren Swed 1870 @ Copenhagen, took over Kiel astr. tel. bureau 1914  
 Stromberg Swed 1882 to US 1917  
 Struve Rus 1886 Wilhelmshafen Naval Obs 1917-19  
 Struve Kharkov 1897 Imperial Russian Army 1916-  
 Taylor GI Br 1886 airplane propeller shafts (Manhattan pr WWII)  
 Thom Scot 1894 1915-21 aeronautical engineering firms (WWII Farnborough)  
 Thompson Br 1892 2nd lt. Royal W Surrey Reg, Fr front lines, back for aircraft @ Farnborough  
 Tikhov Rus 1875 ??  
 Tolman US 1881 chemical warfare service  
 Trumpler Switz 1886, called for Germ service 1914, left for US  
 Turner Br 1861 kept seismic network going  
 Vaisala "Finland" 1891 ??  
 van Biesbroeck Bel 1880 Belg to US to Belg to NL to US (1951-17)  
 Van Maanen NL 1884 in US Van Rhijn NL 1886 ???  
 Van den Boe NL, 1896 Coast artillery & back to Leiden  
 Vogt Ger 1890 "interruption of his studies"  
 Watts US 1889. USNO  
 Weyl Ger 1885 drafted into Ger Army 1915 from Switz but discharged back to ETH 1916  
 Wilkins Br 1896. Br Army  
 Wilkins RE 1886 US, 1918 aeronautical engineer of Bureau of aircraft production  
 Wirtz Ger 1876 Germ Army 1916-18, lost right to teach 1937  
 Wolf of W-R, Fr 1927, retired 1901, returned to home town in Fr, forced to leave when  
     Ger invaded, died another small French town 4 July 1918

1891

Woltjer, J NL 1891 student @ Leiden  
 Zimmer Pol/Cer 1886 field weather service

Wood HB UK/SA/scrived

Zunstra NL 1894 grad in chem eng 1917

Germans, mostly young, from Sirius 48 (Mar 1915) p. 49

last 2 at Ypres

killed in action Liebmann (B-R), Massinger (Heidelberg), Matzdorff (Strassburg)  
 PoW: Brandel (Frankfurt), KuehlMunich, 12months, Sir 49, Jan, 19; FoW exchange  
     Muensch (Potsdam) Zurhellen (Babelsberg killed N Fran 15 July 1916 Sir 50, 146)  
 In service: Bauschinger (Strassburg) Boda (Frankfurt), Ebal (Kiel) Fuss (Berlin),  
     Hoppman (Bonn), Kopff (Heidelberg), Moennichmeyer (Bonn) Osten (?), Redlich (Kiel),  
     Rosenberg (Tuebingen) Schrader (?), Schwarzschild (Potsdam), Werner (Koenigsberg),  
     Zimmer (Bamberg), Bottlinger in military service & other astronomers "in special  
     services for the fatherland"

From Nature: 94, 622 (1915) Croze & son of director Baillaud Paris, summoned  
     Falkova, no astronomers called up, but Backlund's son in Rus. Army

From Nature: 100, 209 (Nov 1917): Mr. Hartle, 1st asst. @ Cambridge died 9 July on Vanguard  
     2nd Lt. F. Bathwhistle, 2nd asst. @ Camb. killed in France

From QJRAS obits (omitting duplications and some amateurs)

Brunt in France providing meteorological advice to Army & Royal Flying Corps, army commiss.

Whitehall of ROG learnt to Admiralty by AL to work on submarine charts & salinity  
 Nassau Turkey 1893 Amer Exped Force in France 1906-26

Darwin, Charles G Br 1888, sound-ranging & flash spotting received MC  
 Edney Br 1875, hydrographic dept of admiralty, back to ROG 1917  
 Newbery 1885 Br deaf not eligible for service  
 Gregory 1892 Br enlisted in ranks & served in France (was EMs advisor at London)  
 Voute Java 1879, director @ Lemberg, imprisoned by Jpn WWII

More Germans on front lines who survived J. Hoymann, J. Hallerich

This is an ongoing project; there will be more names and more information about some of those  
     above. Input very much appreciated!

# SIRIUS

Zeitschrift für populäre Astronomie

Zentralorgan der Freunde und Förderer der Himmelskunde

Herausgegeben

von Dr. Hans Hermann Kritzinger in Berlin

März 1915.

»Wissen und Erkennen sind die Freude und die Berechtigung der Menschheit.« Kosmos

Jeden Monat 1 Heft. — Jährlich 12 Mk.

Verlag von EDUARD HEINRICH MAYER in Leipzig.

INHALT: Astronomen im Kriege. S. 49. — Arthur von Auwers †. S. 50. — Erklärungsversuch der falschen Höhenwinkelschätzung beim Blick nach oben. S. 52. — Zeeman-Effekt und Astrophys. S. 53. — Stella magorum. S. 57. — Caroline Herschel, die Schwester eines berühmten Bruders. S. 60. — Vermischte Nachrichten. S. 63. — Meinungsaustausch. S. 68. — Literatur. S. 69. — Astronomischer Kalender. S. 70. — Saturn und sein Ring. S. 71. — Erscheinungen der Jupitermonde. S. 72.

*readers expert  
in military  
vocabulary!*



Astronomen im Kriege.

Nach Mitteilungen der »Astr. Nachr.« sind auf dem Felde der Ehre geblieben:

Dr. Julius Liebmann, weil Observator der Königlichen Sternwarte Neubabelsberg bei Berlin, gefallen am 22. August in Belgien.

Adam Massinger, weil. Assistent der Großherzogl. Sternwarte zu Heidelberg, gefallen am 21. Oktober bei Ypern.

Dr. Martin Matzdorff, weil. Hilfsarbeiter an der Universitäts-Sternwarte zu Straßburg, als Kriegsfreiwilliger in einem Infanterie-Regiment bei einem Sturmangriff vor Ypern am 2. November gefallen.

Ehre ihrem Andenken!

Sirius 1915. Heft 3.

Kriegsgefangen: Prof. Martin Brendel, Direktor des Planeteninstituts (Frkf. a. M.), in Brest. Dr. A. Kühl. Assistent der K. Sternwarte in München, in Astrachan. Dr. W. Münch, Wiss. Hilfsarbeiter am Astrophys. Obs. Potsdam, Leutnant, verwundet, in Fongères, Dép. Ille et Vilaine (Brétagne). Dr. Zurhellen, Observator der K. Sternwarte Neubabelsberg, in Astrachan.

Herr Professor Kobold teilt in Nr. 25 des Lit. Beibl. der Astron. Nachr. noch folgendes mit: Prof. J. Bauschinger, Direktor der Sternwarte Straßburg, Offizier in der Garnison Straßburg. — Dr. A. Boda, Assistent am Planeteninstitut Frankfurt a. M., Feldartillerie-Regiment Nr. 63, 1. Ersatz-



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batterie, Frankfurt a. M. — M. Ebelt, Assistent bei der Redaktion der Astron. Nachr., Unteroffizier im Landsturm-Inf.-Ersatzbataillon Neumünster. — Dr. H. Fuß, Assistent der Sternwarte Berlin, Seebataillon Kiel. — Dr. J. Hopmann, Assistent der Sternwarte Bonn, Leutnant bei der Feldartillerie. — Prof. A. Kopff, Observator der Königstuhlsternwarte Heidelberg, bei der Luftschifferabteilung. — Prof. C. Mönnichmeyer, Observator der Sternwarte Bonn, Hauptmann der Landwehr in Leipzig. — H. Osten, Feldwebelleutnant im 4. Infanterie-Landsturmbataillon Leipzig. — Dr. E. Redlich, Assistent der Sternwarte Kiel, bei der Fliegerabteilung. — Privatdozent Dr. H. Rosenberg, Leutnant und Adjutant beim Stabe eines Generalkommandos. — Geh. Reg.-Rat C. Schrader, Hauptmann und Batterieführer, Wolfenbüttel. — Geh. Reg.-Rat K. Schwarzschild, Direktor des Astrophys. Obs.

Potsdam, bei der Luftschifferabteilung. — Dr. A. Werner, Assistent der Sternwarte Königsberg, Unteroffizier im 1. Pionierbataillon. — Dr. E. Zinner, Assistent der Sternwarte Bamberg, bei der Luftschifferabteilung.

Nach Mitteilungen an den Herausgeber steht ferner Dr. F. K. Bottlinger als freiw. Kriegskrankenpfleger bei den Badischen Begleittruppen.

Außerdem ist der Schriftleitung noch von verschiedenen Astronomen bekannt, daß sie zur Zeit im besonderen Dienst des Vaterlandes stehen. Aus naheliegenden Gründen können aber keine Mitteilungen darüber gemacht werden, wie denn überhaupt diese Zusammenstellung den sehr berechtigten Wunsch des Leserkreises, über die Beziehungen unserer Wissenschaft zum Kriege unterrichtet zu werden, nur unvollkommen erfüllen kann.

IN BETWEEN, AND "WHATEVER BECAME OF..."

People who served, details of a few

Deaths of Henry Moseley (Gallipoli, atomic number more  
fundamental than atomic weight)

Karl Schwarzschild (pemphigus, home from Russian front;  
Sch. solution, criterion.....)

August Kuhl's memoire

N. Bobrovnikoff (1896-1988) to White Army, to Cyprus to  
Charles U, to Chicago to Berkeley to Perkins Obs, retired to  
Berkeley, saw Halley twice

S. Gaposchkin (1889-1984) Galician front to White Army to  
Berlin (PhD 1933) to Harvard, married Cecilia Payne 1934

R. Minkowski (1895-1976) Russian front to Berlin, Breslau,  
Göttingen,, Hamburg (1922-35) to Mt. W./Palomar (largest  
redshift to date on his last observing night) to Berkeley

*Blackett*      Battle of Jutland to unheeded Churchill  
advisor, advocating tanks & submarines over nuclear bombs  
*Freundlich*, Einstein Tower 1918-33, to Turkey to Charles U to  
St. Andrews, some students survive; resigned 1959, returned  
to Germany (1885-1964)

Thought: Those who survived were clearly tough and long lived!

## August 10, 1915: Henry G.J. Moseley Killed in Action

Science students everywhere are familiar with the modern periodic table, which organizes the chemical elements based on their properties and atomic numbers. Earlier versions, however, followed a far looser organization. In 1789, for example, Antoine Lavoisier grouped his list of 33 elements into gases, metals, earths, and nonmetals. But chemists longed for a classification scheme that evinced more precision.

Dmitri Mendeleev provided a better framework in 1869 with his precursor to our modern periodic table of elements, organizing them according to the sequence of atomic masses. But there were issues with how he chose to order the elements in his

periodic table. He assigned the atoms to the metals

So the atomic numbers of the elements weren't as arbitrary as physical chemists originally thought. Moseley's work provided a firm experimental foundation for Mendeleev's earlier intuitions, resulting in more accurate positioning of the elements within the periodic table.

In fact, Moseley was able to use this mathematical relationship to correctly identify gaps in the periodic table, predicting that there should be elements with atomic numbers 43, 61, 72, and 75. All these elements were subsequently discovered: two radioactive synthetic elements—technetium and promethium, both created in nuclear reactors—and two naturally occurring elements, hafnium and rhenium. (He also predicted th



ШВАРЦШИЛЬД Карл  
(9.X 1873—11.V 1916)



Henry Moseley



ШВАРЦШИЛЬД Мартин  
(р. 31.V 1912)

by H. H.

## Karl Schwarzschild †. Kritzinger

Als ich Karl Schwarzschild das letztemal vor einigen Monaten sah, empfing er mich — der Leutnant den Kriegsfreiwilligen — mit einer heiteren Bemerkung, daß wir uns gerade hier (in einem Berliner militärischen Institut) »in solcher Verkleidung« wiederfinden mußten, beide beschäftigt mit der Anwendung unserer Wissenschaft auf die Aufgaben der Artillerie. Von dem schweren Leiden, das er sich an der Front zugezogen hatte, merkte man ihm wenig an, und ich hätte nie geglaubt, daß diese flüchtige Begrüßung der letzte persönliche Eindruck von Schwarzschild sein sollte. Erst nach dem Kriege wird in den Schriften der Berliner Akademie jene Arbeit zur Veröffentlichung gelangen, die seine geniale Vielseitigkeit auch im Dienst der Kriegswissenschaften zeigt.

Es kann in diesem kurzen Nekrolog unmöglich mein Ziel sein, den

Sirius 1916. Heft 7.

Forscher Schwarzschild näher zu kennzeichnen<sup>1)</sup>. Es liegt mir vielmehr daran, mit ein paar Strichen sein Wesen und seine Entwicklung zu charakterisieren, weil diese gerade für kommende Forscher vorbildlich sein sollte.

Geboren 1873 in Frankfurt a. M., dessen Dialekt er namentlich im gemütlichen Kreise nie ganz verleugnete, und unter günstigen äußeren Verhältnissen aufgewachsen, hatte er sich schon als Gymnasiast mit Astronomic beschäftigt und als Primaner in den »Astronomischen Nachrichten« eine Arbeit über Doppelsterne veröffentlicht. Damit war die Richtung seiner späteren Forschung bereits gewiesen. Das Hauptmerkmal seiner Arbeitsweise ist die

<sup>1)</sup> Sobald die Astronomische Gesellschaft jemanden gefunden haben wird, der diese ungeheuer schwere Aufgabe löst, werden auch wir darauf zurückkommen.

Schriftl.

v. 49 July / Aug '16 <sup>17</sup>

# Zwölf Monate in russischer Gefangenschaft.<sup>1)</sup>

Von Dr. August Kühl, Assistent an der Münchner Sternwarte, z. Z. im Felde.

Nach länger vorbereiteten Plänen erhielt ich im Frühjahr 1914 von der Kgl. Bayer. Akademie der Wissenschaft und der Kgl. Sternwarte zu München den Auftrag, zu photographischen Beobachtungen der totalen Sonnenfinsternis (21. August 1914) eine Expedition nach Feodosia in der Krim zu unternehmen. Wie alle übrigen Expeditionen, so erfolgte auch die meine im Vertrauen auf die mehrfachen Einladungen, die auf verschiedenen Kongressen von dem Direktor der Petersburger Sternwarte W. Staatsrat Exz. Prof. Dr. Backlund im Auftrage der Russischen Akademie der Wissenschaften zu Petersburg und des russischen Finanzministeriums mündlich ergangen waren und im Frühjahr durch gedruckte Zir-

kulare, weitgehende Reise- und Zollvergünstigungen einschließend, wiederholt wurden. Einen photographischen Refraktor zur Ausführung meiner Beobachtungen baute die Firma Zeiß-Jena und stellte ihn der Sternwarte München leihweise zur Verfügung. Er wurde in den ersten Tagen des Monats Juli per Eilgut nach Feodosia abgesandt. Ich selbst reiste am 26. Juli von München ab, um in Berlin mit den Herren vom Astrophysikalischen Institut in Potsdam, Geh. Rat Prof. Dr. Kempf und Prof. Dr. Ludendorff, zusammenzutreffen und zugleich zu hören, ob die Weiterreise ratsam sei. Am Montag, 27. Juli, nachmittags, erreichte unsere Reisegesellschaft, der sich noch Geheimrat Schrader, Vorsitzender der Reichskommission für Seeschifferprüfungen, angeschlossen hatte, die Station Deutsch-Eylau; ein Telegramm des Kultusministeriums mit dem ungefähren Wortlaut: »Reise ruhig fortsetzen« beseitigte die letzten Bedenken vor dem Überschreiten der

<sup>1)</sup> Nachstehende Aufzeichnungen bilden ein Dokument zur Geschichte der Astronomie. Der Verfasser, der sie aus den »Süddeutschen Monatsheften« zum Abdruck zur Verfügung stellte, ist auf den Inhalt für das Auswärtige Amt vereidigt worden. Schriftl.



The first General Assembly of the IAU, held at Rome from 2 to 10 International Union for Geodesy and Geophysics), and H. Deslandres 1922. In the President's chair: B. Baillaud. On his right hand, in this (IAU Vice-President 1922-1928). Behind-in between Baillaud and Dyson: General Secretary A. Fowler, R.G. Aitken, R.P. Cortie, and C.E. St. E. Strömgren (Copenhagen, Head Central Bureau for Telegrams). (For more on his left hand: Vice-President F. Dyson, P. Stroobant, G. Bigourdan identifications, see Bull. Soc. Astron. de France, September 1922, p. 369.) of the Bureau de l'Heure), G. Armellini, Ch. Lallement (President of (Collection Utrecht)

The Standing Committees and their first Presidents are listed below [7]:

- No. 1, Relativity (A.S. Eddington), *Abolished 1925*  
No. 2, Re-editing and publication of ancient works (J.L.E. Dreyer),  
No. 3, Notations and Units, and the format of publications (P. Stroobant),  
No. 4, Ephemerides (P.H. Cowell), ✕  
No. 5, Abstracts and Bibliography (B. Baillaud), ✕  
No. 6, Astronomical Telegrams (G. Lecointe),  
No. 7, Celestial Mechanics and Tables (H. Andoyer), ✕  
No. 8, Meridian Astronomy (S.S. Hough), ✕  
No. 9, Theoretical and Applied Astronomical Optics (M. Hamy), ✕  
No. 10, Solar Radiation (C.G. Abbot), ✕  
No. 11, Spectroscopic Velocities (H. Deslandres),  
No. 12, Atmosphere of the Sun (G.E. Hale), ✕  
No. 13, Astronomical Expeditions (A. de la Baume-Pluvine),  
No. 14, Wavelength Standards and Spectral Tables for the Sun (C.E. St.John),  
No. 15, Rotation of the Sun (H.F. Newall),  
No. 16, Physics of Planets (V. Cerulli), ✕  
No. 17, Lunar Nomenclature (H.H. Turner),  
No. 18, Radiotelegraphic Longitude Determination (G. Ferrié),  
No. 19, Latitude Variation (H. Kimura),  
No. 20, Minor Planets (E.W. Brown), ✕  
No. 21, Comets (A.O. Leuschner),  
No. 22, Meteorites (W.F. Denning), ✕  
No. 23, Carte du Ciel (H.H. Turner),  
No. 24, Stellar Parallaxes (F. Schlesinger),  
No. 25, Stellar Photometry (F.H. Seares), ✕  
No. 26, Double Stars (R.G. Aitken),  
No. 27, Variable Stars (S.I. Bailey),  
No. 28, Nebulae (G. Bigourdan) → *Galaxies (pres. EMB,*  
No. 29, Spectral Classification (W.S. Adams), ✕ *Vera Rubin, VT;*  
No. 30, Stellar Radial Velocities (W.W. Campbell), ✕ *Elaine Sadler*  
No. 31, Time (R.A. Sampson), ✕  
No. 32, Calendar Reform (G. Bigourdan). *François Combes*

The reports of these 32 commissions would be the main substance for the General Assembly in 1922.

## IAU NATIONAL MEMBERSHIPS

Founders 1920

Belgium, Canada, France, Greece, Italy, Japan, Mexico (1921)  
United Kingdom, USA

Round 2, 1922, some neutrals admitted

Czechoslovakia, Denmark, Norway, Poland, Rumania, Spain  
Switzerland (1923), Netherlands

Other interwar

Argentina, Australia, China, Yugoslavia, USSR, Portugal,  
South Africa, Sweden, Vatican City

Significant "postwar"

Austria (1955), Bulgaria (1957), Germany (1951),  
Hungary (1947), Israel (1954), Turkey (1961)

Membership now largely financial issue not war & peace (except  
perhaps the dual Chinese membership)

THEORY after Great War had slowed dissemination of GR and  
calculation of its consequences

Friedmann, Lemaitre, de Sitter solutions; Einstein's  
initial objections and reconsideration



Fig. 9.5 Lemaître and Einstein. Georges Lemaître (1894–1966) and Albert Einstein (1879–1955), photographed around 1933. (Archives Lemaître, Université Catholique de Louvain.)

Sartorial assistance  
needed. Post-  
WWI stories



Fig. 14.1 Einstein and de Sitter. Photographed 8 January 1932 at



Fig. 7.1 Alexander Friedmann (1888–1925). Friedmann was t

Born Kendal, (Cumbria), England,  
28 December 1882  
Died Cambridge, England, 22 November 1944



Eddington, Arthur Stanley. Reproduced by permission of



Fig. 8.1 Slipher at the Lowell Obs



ЭИНШТЕЙН Альберт  
(14.III 1879—18.IV 1955)



ЦВИККИ Фриц  
(14.II 1898—8.II 1974)



ХОКИНГ Стивен Уильям  
(р. 8.I 1942)

*Peripheral to main story  
but cute pictures*

## MISCELLANY

1915 Germany provided Britain with 32,000 pairs of binoculars through Switz (hoping for rubber in return)

Blackett in Navy (Jutland) in WWII urged Churchill toward anti-submarine tasks, away from bombs (nuclear) vs Lindemann Women into labs and colleges; it didn't last Rudolf Weigl observed typhus; developed vaccine in WWII Charles Gifford studied battlefield craters - all circular; deduced lunar craters = impact vs. ~~Volcanic~~

Kohlschütter PoW in Gibraltar & Maidenhead

Chadwick PoW in Germany, set up lab using equipment from Geiger & Th from toothpaste (recent Th/toothpaste argument)

"Chemical cabinets" (chemistry sets) disappeared from US; had used German chemicals

Hale & NRC (1916), detection of U-boats first task; Edison heading Naval Consulting Board didn't think sci. research or physicists necessary

London Scottish Regiment included Ronald Colman, Claude Rains, Herbert Marshall, Cedrick Hardwick, Basil Rathbone

Cambridge & Oxford 2/3 of undergrads enlisted early months, 1/3 of Oxford 1913 class killed ~~for~~

No direct-line Trimble fought ~~in~~ US ~~1911~~, ever (careful choice of birth years, places, & skills) *Ayer, 1721*



Women testing explosives at a factory in Gretna, UK, turned yellow from the toxic TNT and were paid one-third less than their male colleagues.



LOCHNAGAR CRATER MEMORIAL

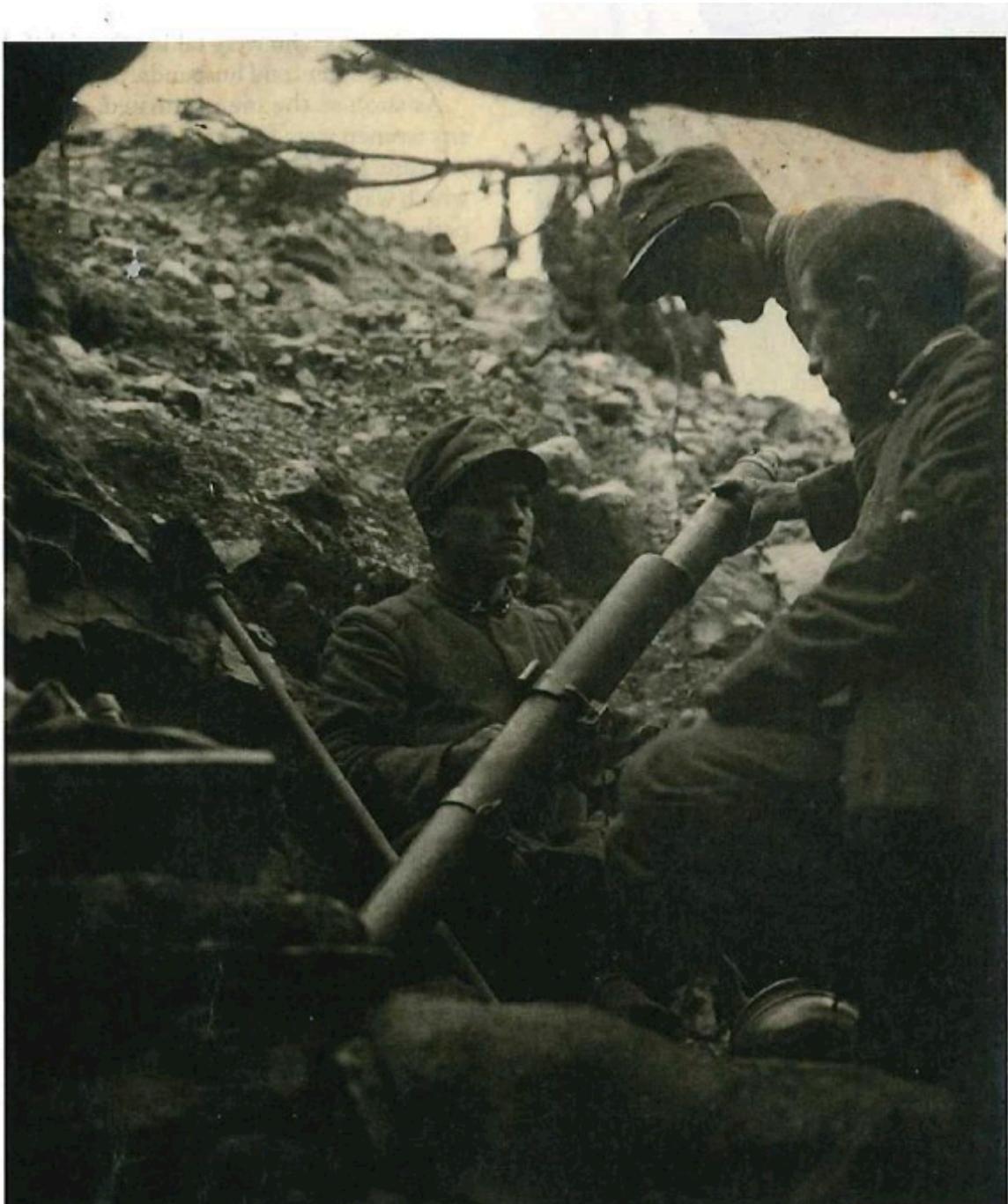
**TERRESTRIAL ANALOG** Lochnagar Crater in northern France, the largest crater formed in World War I, was produced on July 1, 1916 by a massive British mine explosion detonated in the Battle of the Somme during an Allied attempt to break through German lines. The Germans repulsed the attack. The crater is approximately 300 feet (90 meters) across and 70 feet deep.



## History of Astronomy



**METEOR CRATER** At the beginning of the 20th century, most scientists thought that Arizona's Meteor Crater (known then as Coon Butte) was a volcanic structure. Detailed work by Algernon Charles Gifford, Daniel Moreau Barringer, Ernst J. Öpik, Ralph Baldwin, Eugene Shoemaker, and other scientists showed how craters such as this one were formed explosively by infalling meteorites.



**Soldiers load a Stokes mortar, invented in 1915 by engineer Wilfred Stokes for trench warfare.** © IWM (Q 1000) In November 1914, British troops in the Ypres Salient were faced with a new type of weapon. The German gas shells had been inserted into mortars



Félix Vallotton: The Rape of Europa, 1908

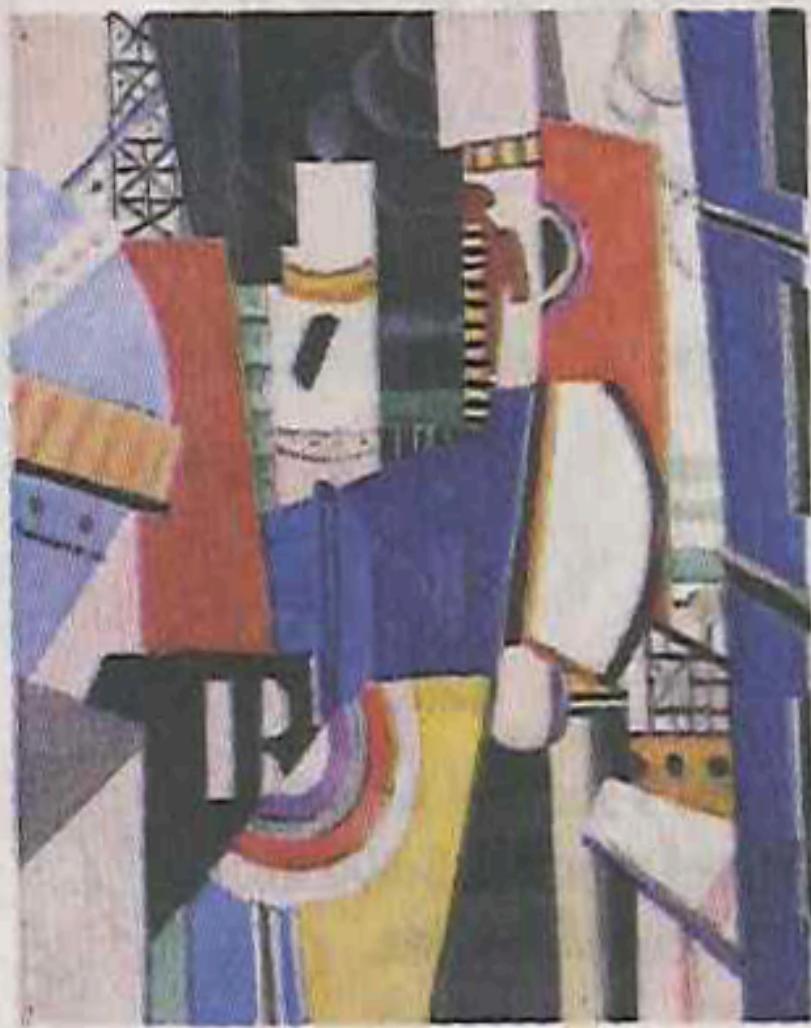


Félix Vallotton: Verdun, 1917

Musée de l'Armée, Paris

10

# DON'T MISS: JULY 26-AUG. 1



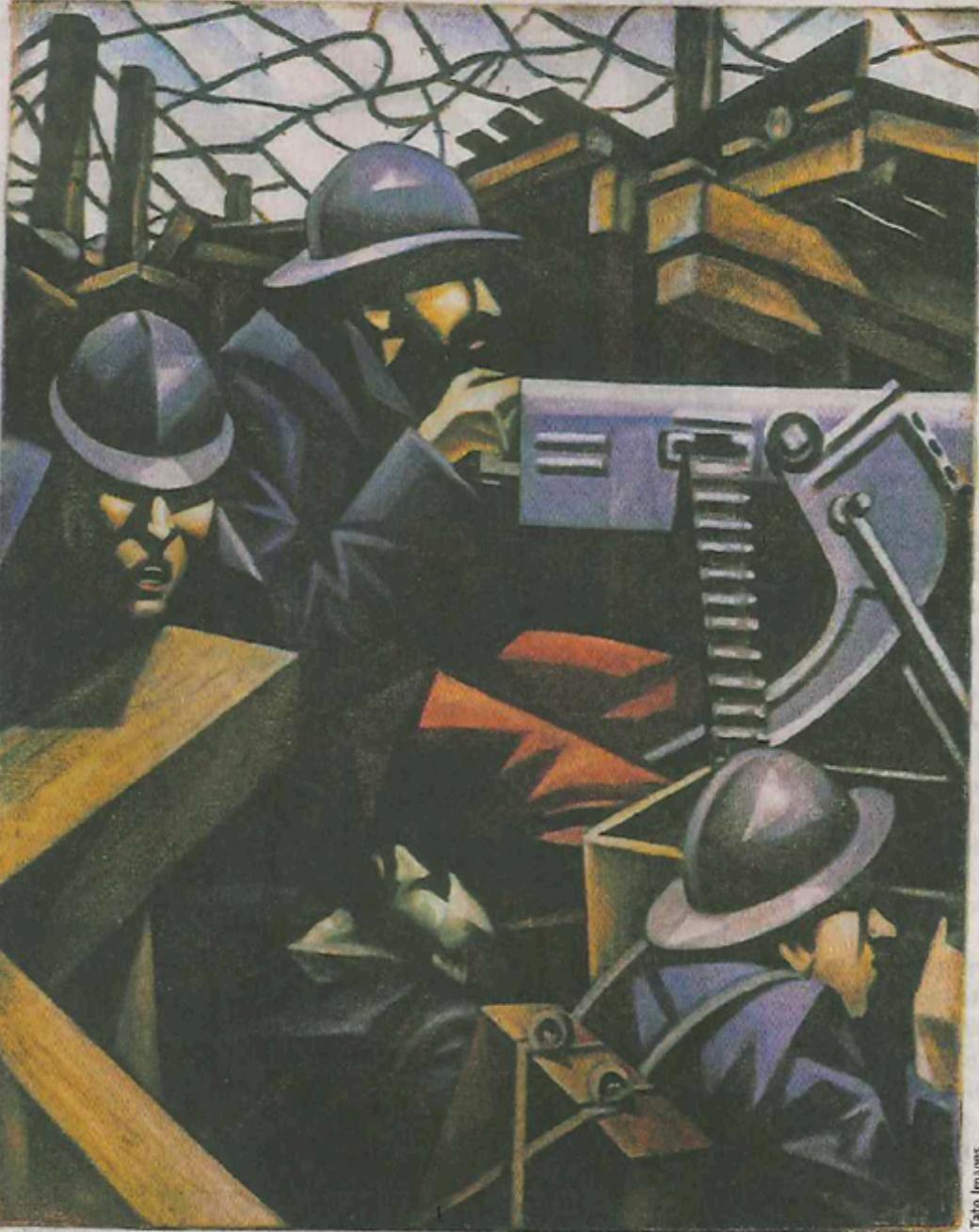
## The Art of War

Toledo Museum of Art, Ohio,  
through Oct. 19

Commemorating the centennial of the start of World War I, "The Great War: Art on the Front Line" features paintings, sculpture, and works on paper by artists including Otto Dix, George Grosz and Childe Hassam. At left, Fernand Léger's 1919 sketch for "The City."

(l-r) Toledo Museum of Art, Purchased with funds from the Libbey Endowment, Gift of Edward Drummond Lib

LA MITRAILLEUSE ORW NEVINSON



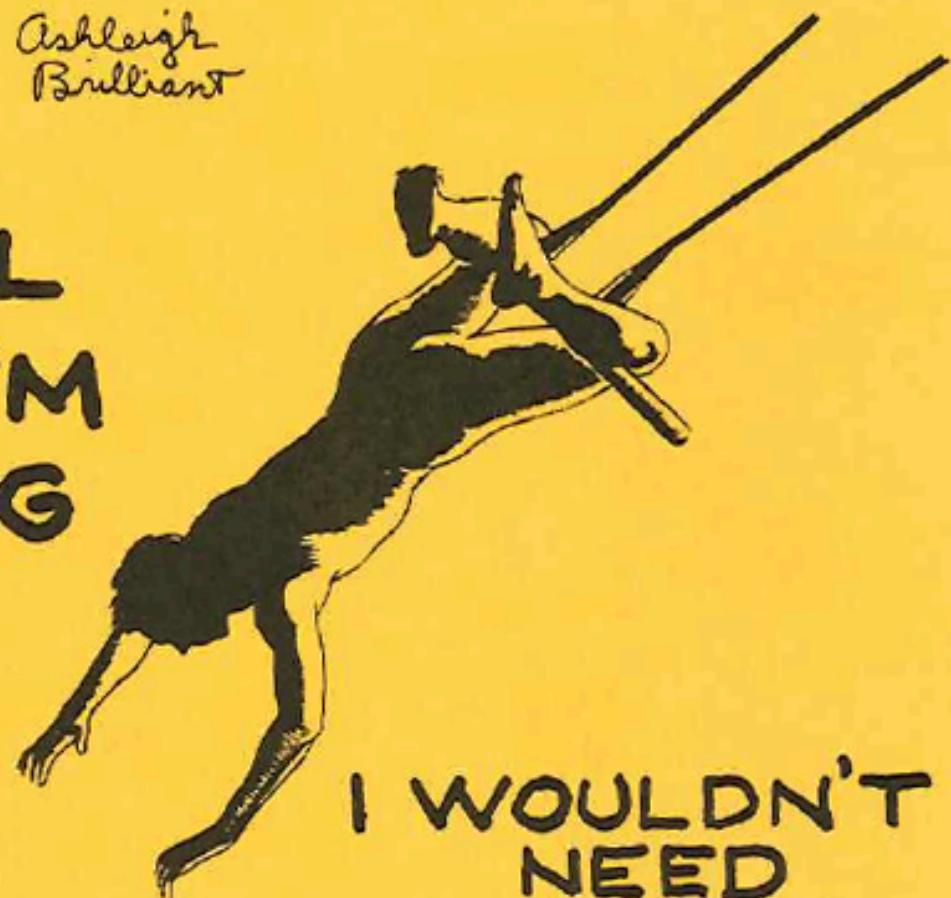
Tate Images

THE PAINTER'S intimate depiction brought viewers into close contact with soldiers, in contrast with the often more scenic views of war photography.

POT-SHOTS NO. 3343.

Ashleigh  
Brilliant

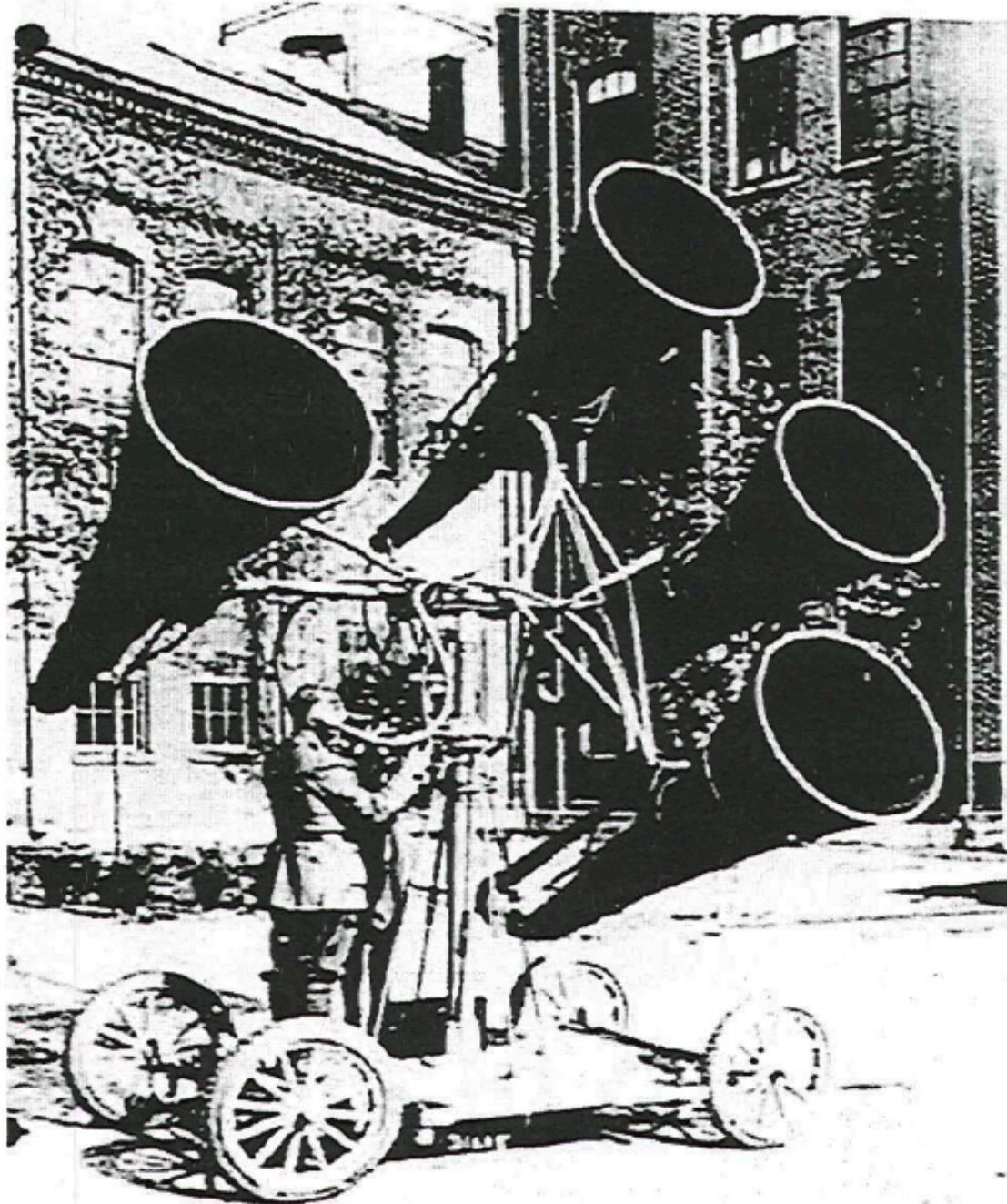
**IF I HAD  
MORE SKILL  
IN WHAT I'M  
ATTEMPTING**



**I WOULDN'T  
NEED  
SO MUCH  
COURAGE.**

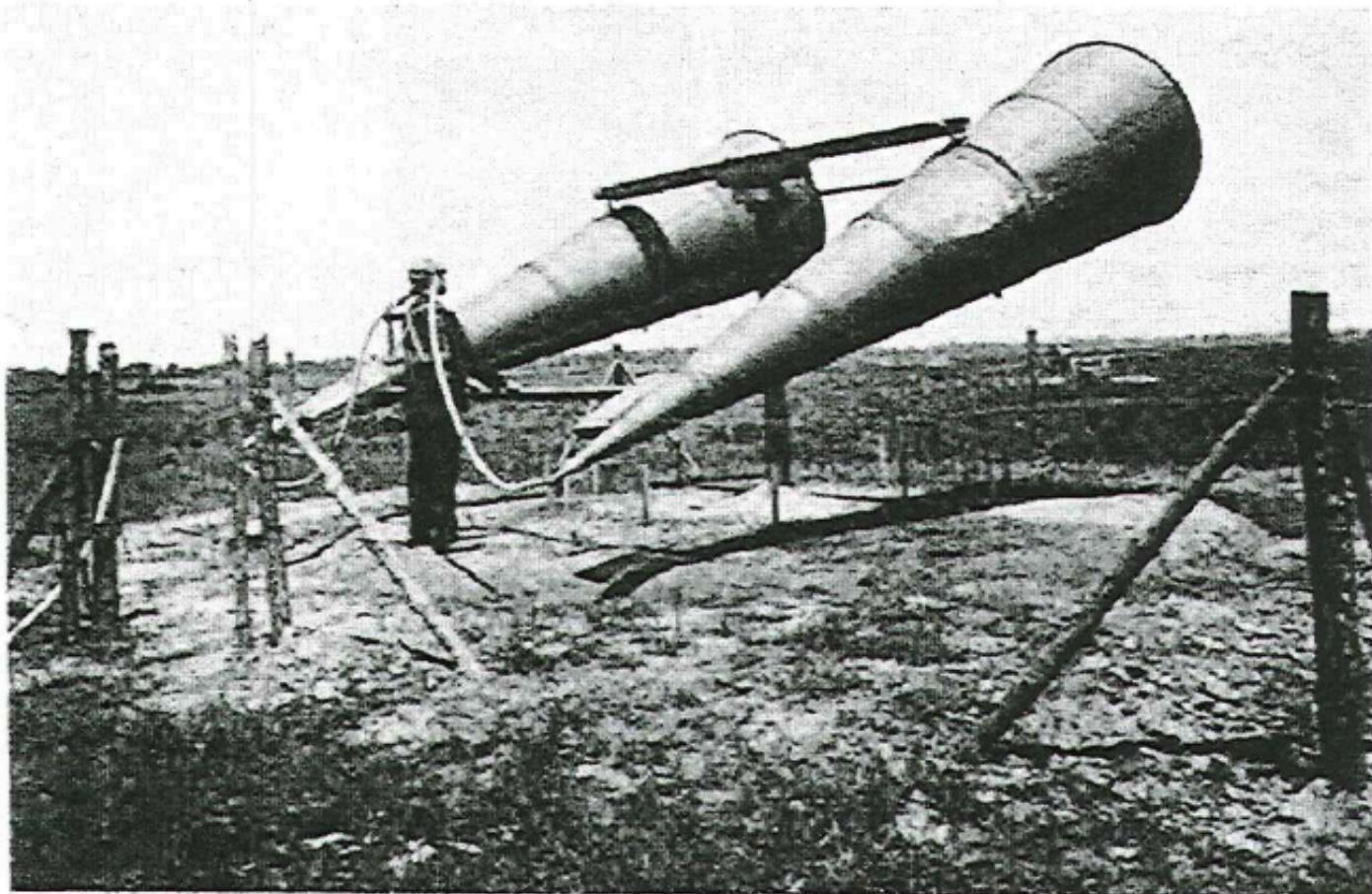
©ASHLEIGH BRILLIANT 1985.  
SANTA BARBARA

# Aircraft Detection Horns, WWI Mobile Version

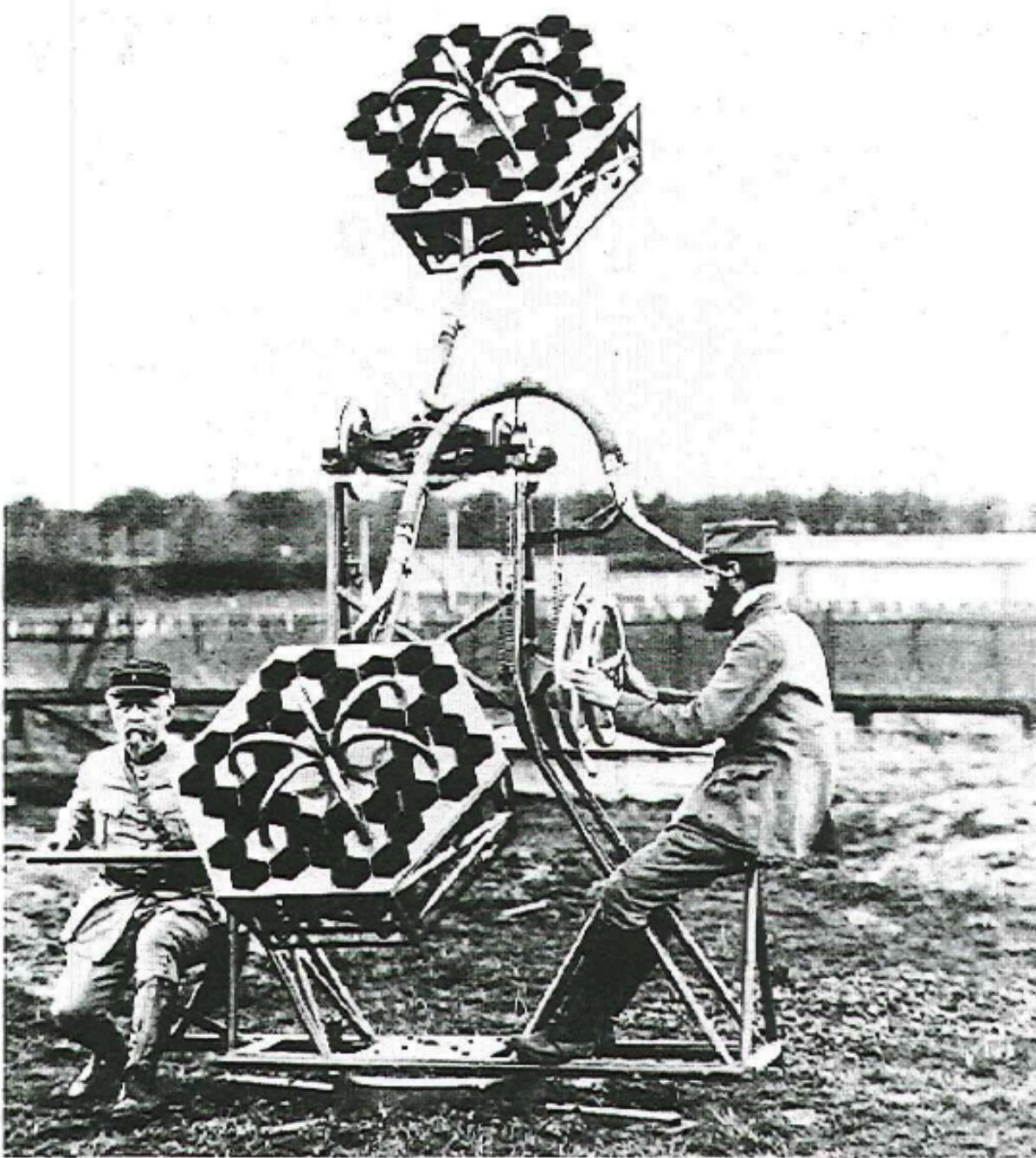


# Aircraft Detection, WWI

## Rotatable in the Field



Eighteen-foot horns for locating invisible aircraft devised by a subcommittee of the National Research Council's Committee on Physics during World War I (From the archives of the Academy).



Jean Perrin (1870–1942) with telesite meter (of mysterious purpose), France, 1919.

# Cease Fire, 11 a.m., Nov. 11, 1918

## The Front Near the River Moselle

FRONTISPICE.

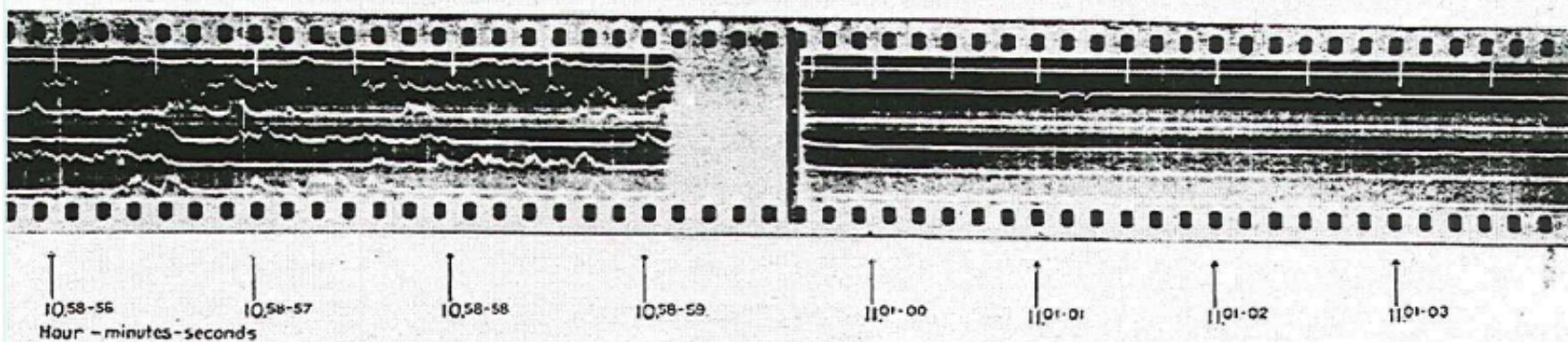
"THE END OF THE WAR."

A GRAPHIC RECORD.

One minute before  
the hour.  
All guns firing.

Nov. 11, 1918.  
11 A. M.

One minute after  
the hour.  
All guns silent.



This is the last record by sound ranging of artillery activity on the American front near the River Moselle. It is the reproduction of a piece of recording tape as it issued from an American sound-ranging apparatus when the hour of 11 o'clock on the morning of November 11, 1918, brought the general order to cease firing, and the great war came to an end. Six seconds of sound recording are shown. The broken character of the records on the left indicates great artillery activity; the lack of irregularities on the right indicates almost complete cessation of firing; the two breaks in the second line probably being due to the exuberance of a doughboy firing his pistol twice close to one of the recording microphones on the front in celebration of the dawn of peace. The two minutes on either side of the exact armistice hour have been cut from the strip to emphasize the contrast. Sound ranging was an important means of locating the positions and calibers of enemy guns. A description of these wonderful devices, which were a secret with America and the Allies, is given in Book III, chapter 4.

## STATUS OF PROJECT

100 or so pages of notes on all sorts of 1914-1919 items,  
mostly from literature in English

1000 or so WWI books already exist; science is not a major  
topic in most of them

None-English literature? Hilmar Duerbeck culled Sirius  
(d. Jan 2013). Cull Naturwissenschaftern (much less  
forthcoming than Nature about deaths, supply problems....?)

Russian? Not sure what exists (& Meinhard Meyer d. 2012)

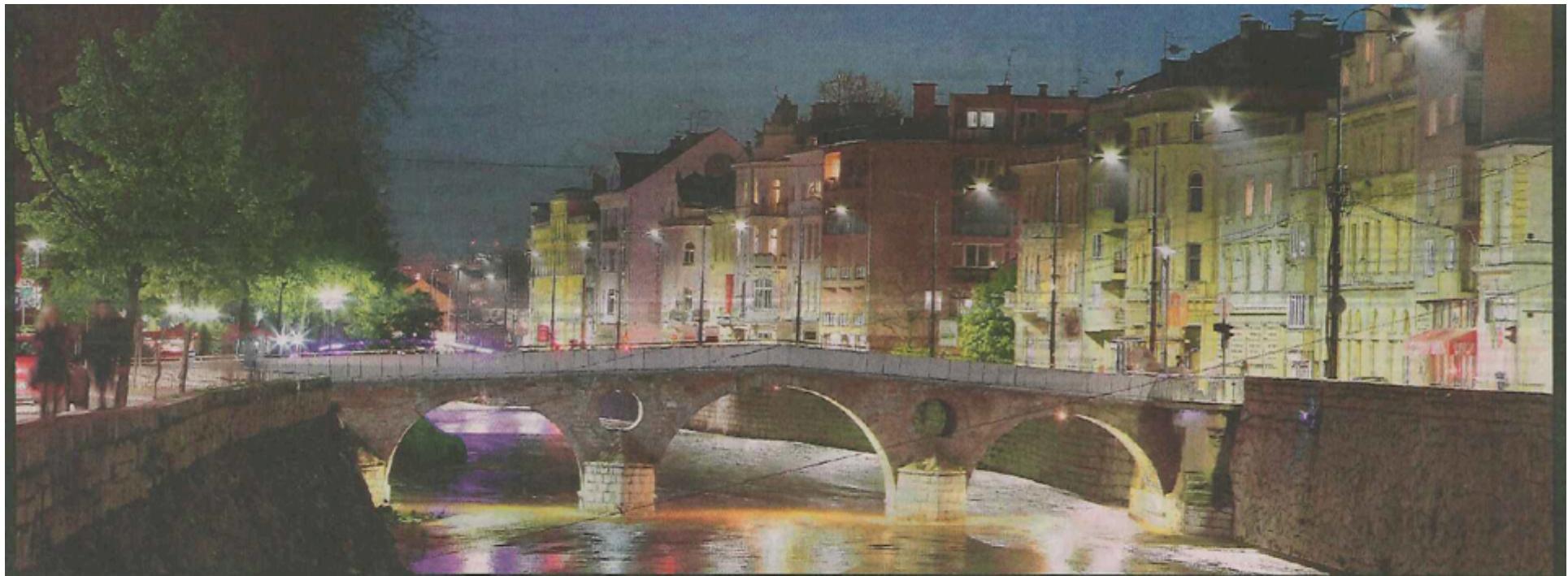
Collaborators in good health welcome!

Don't take  
the present moment  
too seriously —

It won't be  
here for long.

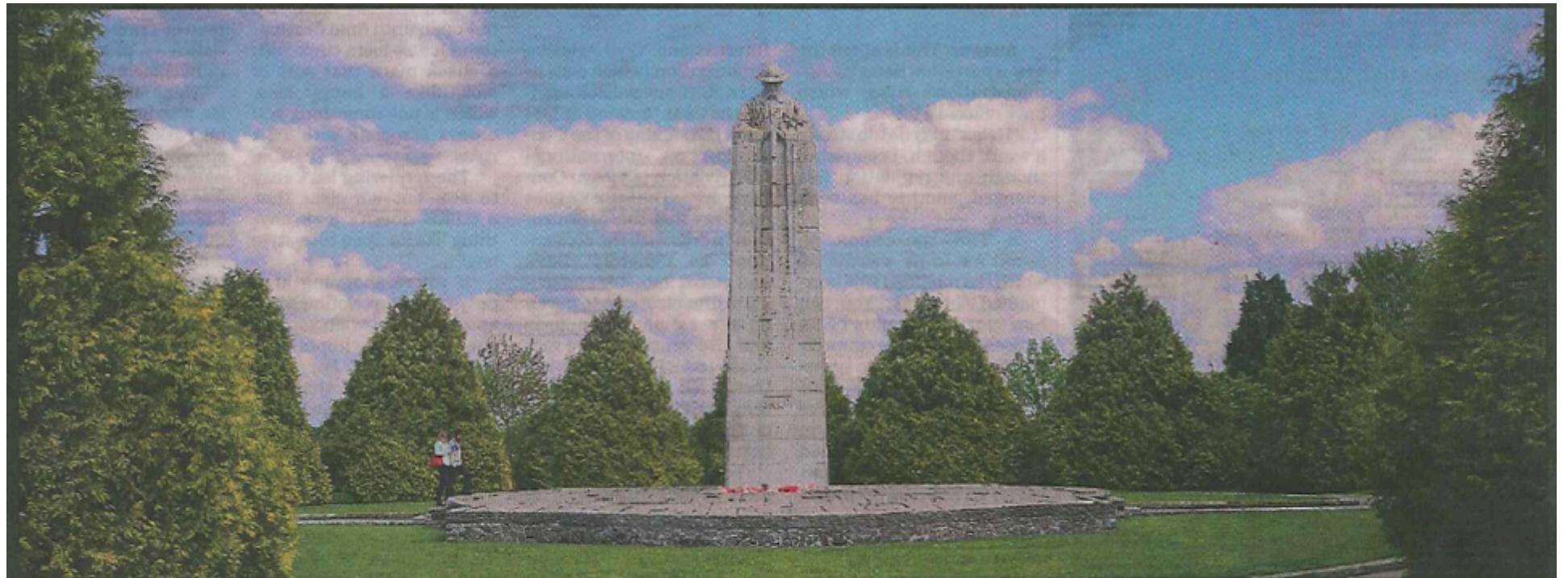


Ashleigh  
Brilliant



# SARAJEVO

A century ago, gunfire in what is today a city in Bosnia-Herzegovina sparked a war that killed 9 million. Now, the key words are perseverance and peace. **L4**

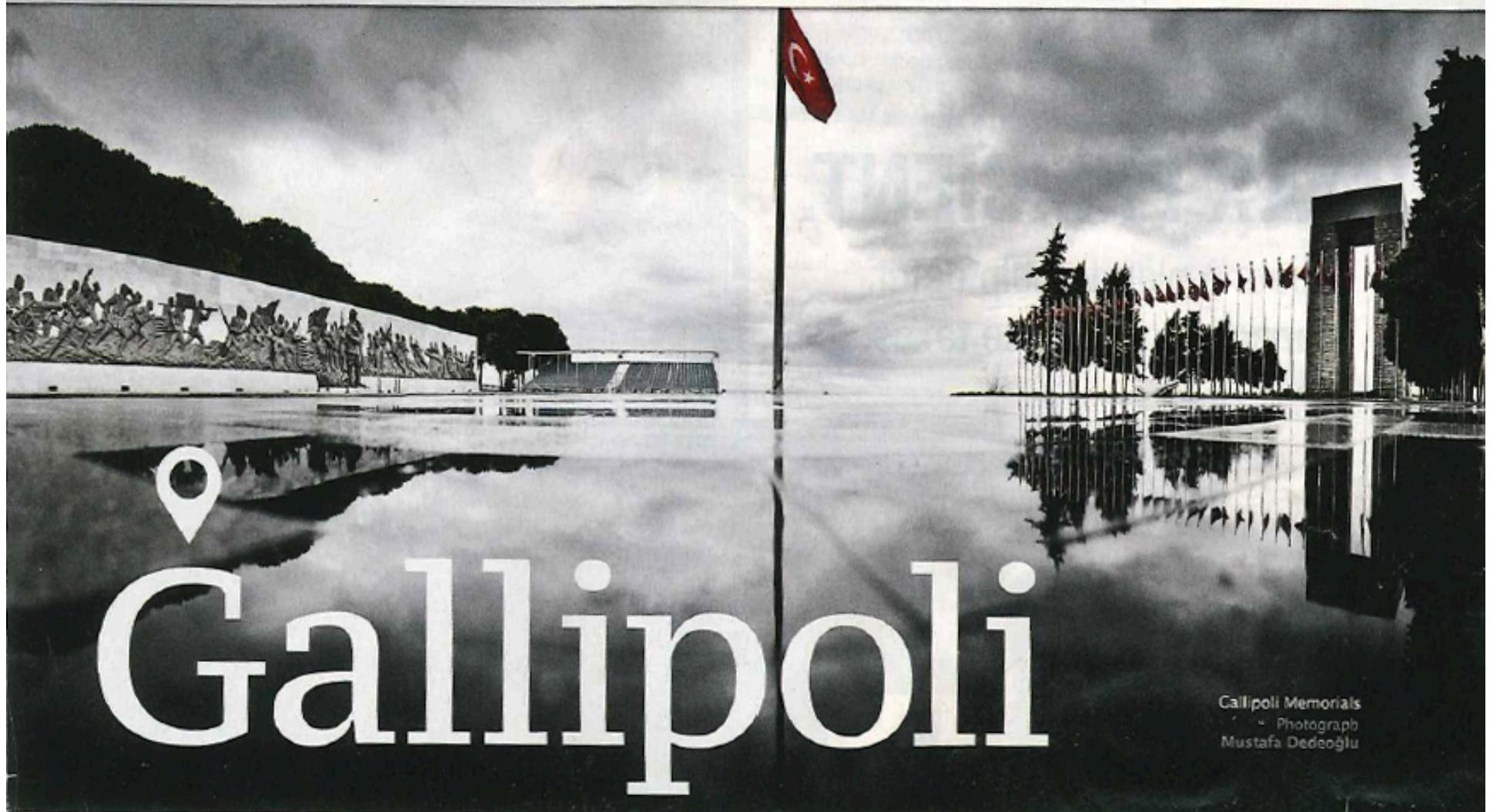


YPRES | A solemn remembrance is staged nightly where the fields hold crosses row on row, a reminder of the tragedy and the triumph that have made this Belgian city more than a symbol. **L4**

SPECIAL ADVERTISING SECTION

# CULTURAL JOURNEYS

TURKEY



📍  

# Gallipoli

Gallipoli Memorials  
Photograph  
Mustafa Dedeoğlu

©ASHLEIGH BRILLIANT 1985.  
SANTA BARBARA

Ashleigh Brilliant

POT-SHOTS NO. 3877.

# THE ONLY REQUIREMENT FOR EVENTUALLY GETTING THERE

IS TO KEEP GOING  
IN THE RIGHT  
DIRECTION.

