Impact of WWI 1914-1919 on

people, skills, infrastructure, culture, international cooperation in

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

Passchendaele (Ypres) Oct 1917

A Teachable Century

Physics

IUPAP

IAU Div. C Aug 2015

Chemistry

ACS SF August 10th 2014

APS Baltimore Apr.

Astronomy

IAU

AAI Heidelberg MAR 2015

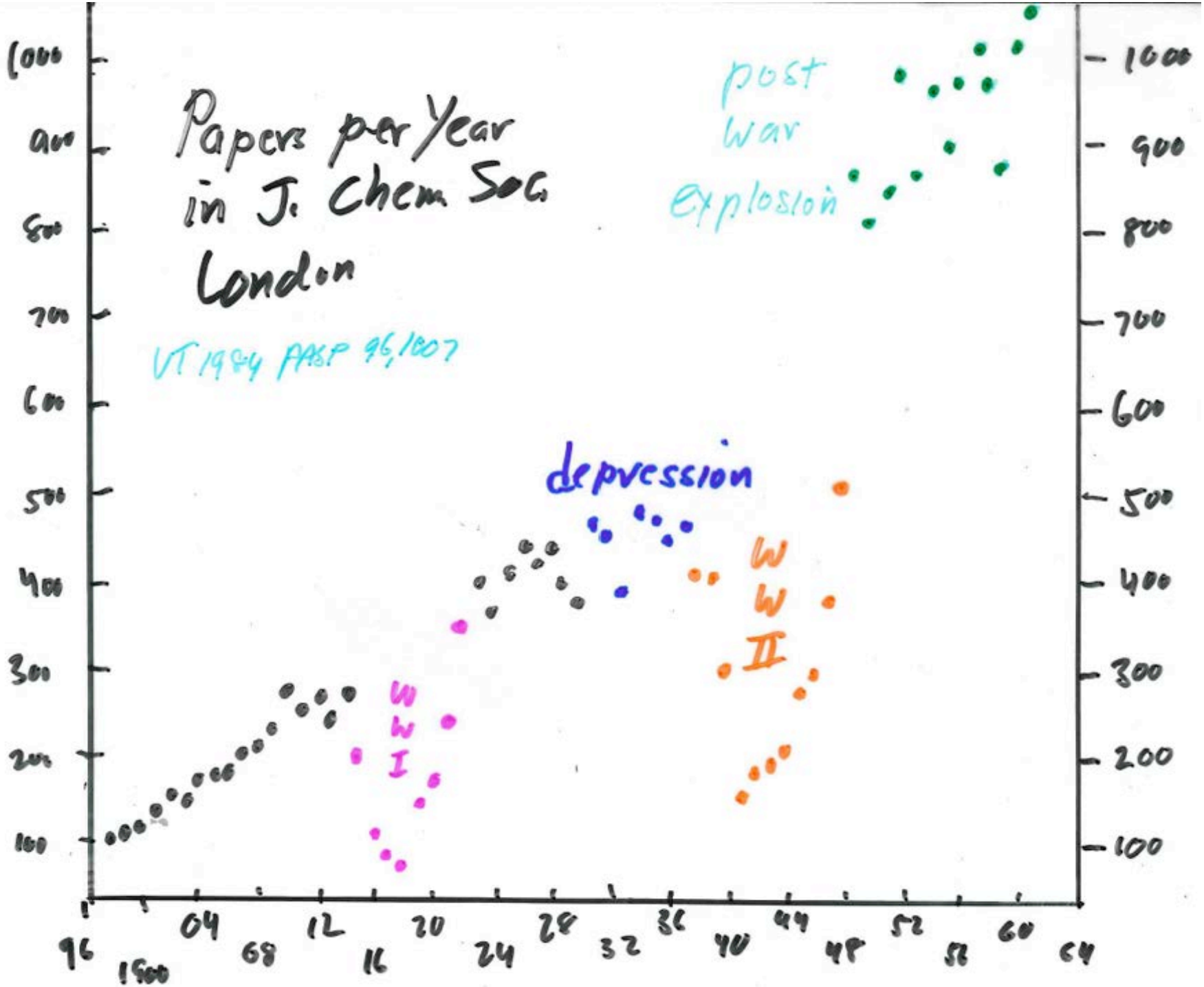
A SORT OF OUTLINE

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 expedidtion, 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


Papers per Year
in J. Chem Soc
London
post
war
explosion
depression
WW
I
WW
II
1000
900
800
700
600
500
400
300
200
100
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1900
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52
56
60
64

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 Goldfish. 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 membor of family (who is still compos mentis)and trace their chains

Families of recent immigrants might reach Ho Chi Minh, Mao Tse Tung (mè 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	Austriaannexes Bosnia & Herzegovina from Ott. Empire (B&H object)
	1914	
Shapley to Mt. W. Slipher 40 S V_r's at AAS	Freundlich eclipse exp. captured in Crimea	Sarajevo and all to Guns of August
Franklin-Adams plates published	French use tear gas on W front	Hitler volunteers to Bavarian army, serves as dispatch runner
Kapteyn star stream velocities; considers absorption		Louvain U library burned
Wolf RAS Gold medal	**1923**	
Cepheids in M31 & NGC 6822 EPH		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_r (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 newsof GR from de Sitter)

1919 Hubble to Mt W; Solar eclipse expedition finds light bent
Shapleyopposes 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 (radiactivity 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 mittigated 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 ofthe Admiralty

1912 Wilson elected; first Balkan War

1913 Last time Wm. II, George V, and Nicholas II together (wedding of WM II's daught to Duke of Brunswich)
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 colleauges 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 transcontintnal 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 overturns 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.

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	137.37	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	132.81	Potassium	K	39.10
Calcium	Ca	40.09	Praseodymium	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	Gl	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
Lanthanium	La	139.0	Xenon	Xe	130.2
Lead	Pb	207.1	Ytterbium	Yb	
Lithium	Li	6.94	(Neoytterbium		172.0
Lutecium	Lu	174.0	Yttrium	Yt	89.0
Magnesium	Mg	24.32	Zinc	Zn	65.37
Manganese	Mn	54.93	Zirconium	Zr	90.6
Mercury	Hg	200.0			
Molybdenum	Mo	96.0			

Nb

Be

Winston's Cumulative Ency. 1914 83 elements

missing: Ho Hf Tc Pm

UThRa decay products

sorting of R.E.'s – 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 $h_s = 21{\cdot}2$ *m*. 7ʰ		2ʰ		9ʰ		mittlere Geschw.	Niederschlag in *mm* 7ʰ h_r = 0·7 *m*	Insolation[1]) + 0
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 ⊃⊃ ●	59·4
5	N	7	WSW	10	WNW	4	7·6	27·20 ●	51·9
6	NW	1	SSE	6	ENE	8	4·4	20·60 ⊃ ●	57·0
7	WNW	15	NW	19	WNW	1	14·2		52·9
8	—	0	WNW	7	WNW	9	4·9	3·65 ⊃ ●	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	—	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 ⊃ ●	45·1
16	W	3	W	7	N	4	4·5		56·0
17	E	3	E	10	NE	9	7·7	4·61 ⊃ ●	27·7
18	NNE	6	E	7	—	0	5·5	0·65 ●	27·1
19	WSW	4	W	1	WNW	6	4·8	4·66 ≺ ●	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	3	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 ⊃⊃ ●	55·3
29	NE	1	NE	10	NNE	4	5·5	— — ⊃⊃	55·9
30	—	0	ENE	4	—	0	1·3	— — ⊃⊃	54·1
31	W	7	W	16	N	9	8·0	1·23 ⊃ ●	50·2
M.	—	3·7	—	9·3	—	3·9	5·7	—	51·8

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

Windverteilung

N	NE	E	SE	S	SW	W	NW	Windstillen
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 8ʰ—9ʰ a. m. bei N.

Niederschlagshöhe: in 13·6 *m*. Höhe 55·61 *mm*, in 0·7 *m*. Höhe 62·99 *mm*.

[1]) Schwarzkugelthermometer im Vakuum.

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-Nove German mustard gas at Passchendaele(village) 1917

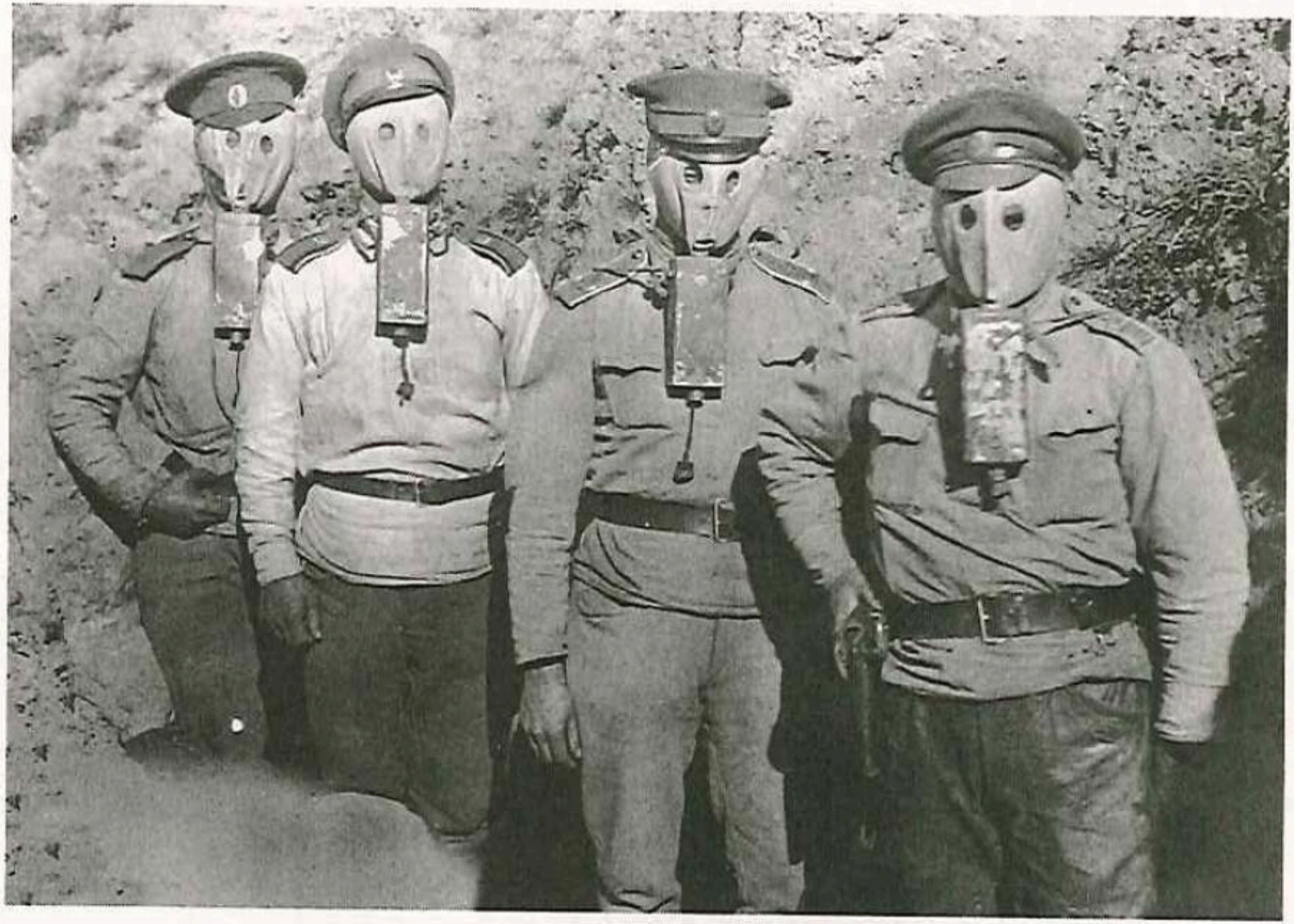
Rutherford never forgave Haber

Further development led to gases used in WWII camps
Violation of Hague Convention removed barriers (US defoliants in Vietnam and all)

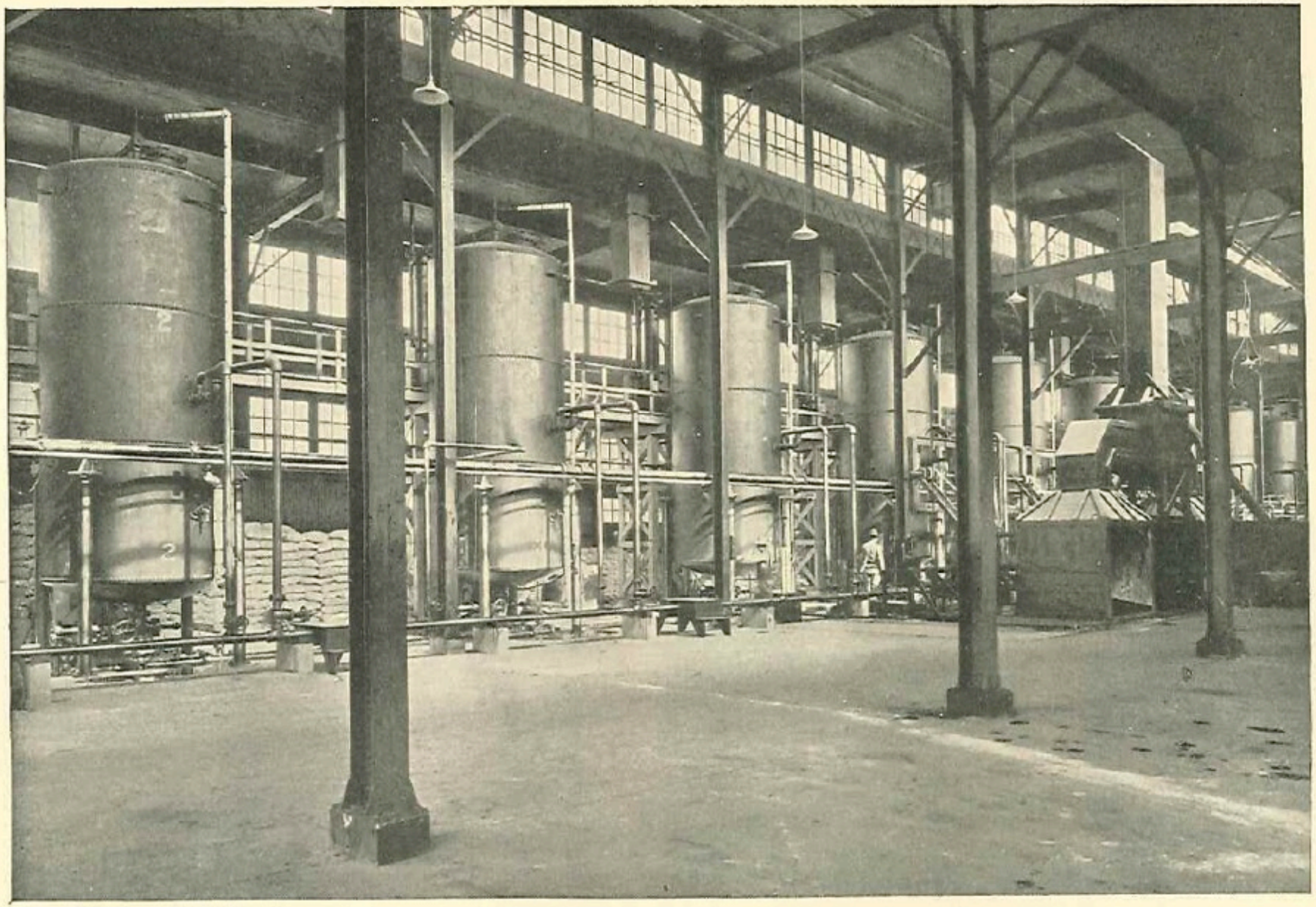
Definitely not decisive in the war nor in many battles compared to barbed wire and tanks

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.



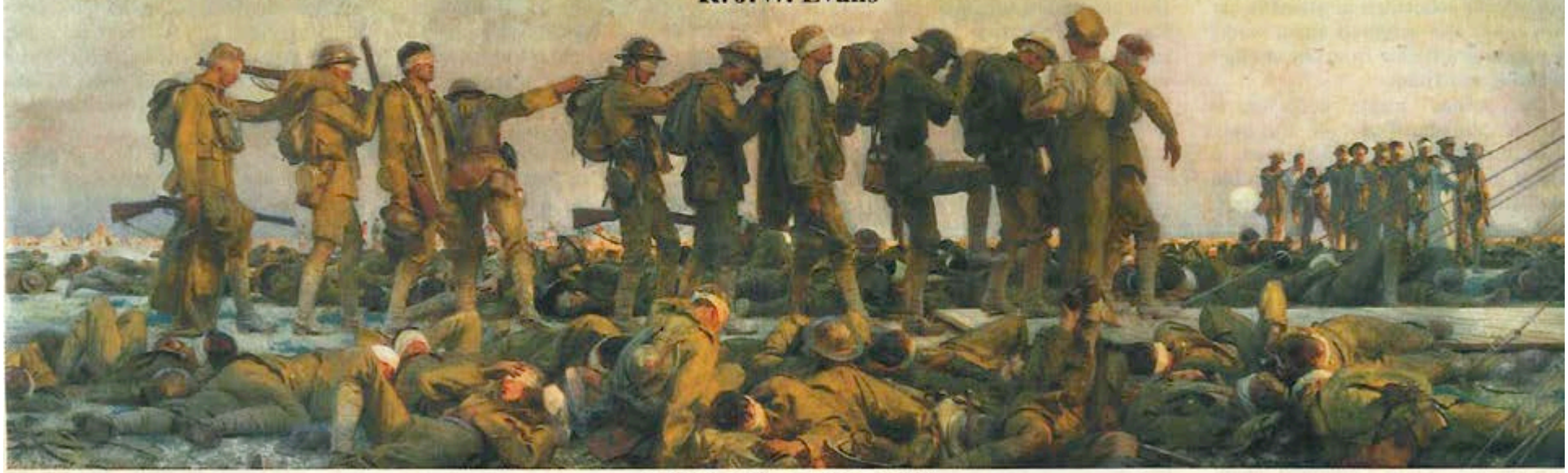
From "America's Munitions"

THE CHLORPICRIN PLANT AT THE EDGEWOOD ARSENAL

From these stills, filled with a mixture of bleaching powder, lime, and picric acid, the poisonous gas, chlorpicrin, 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

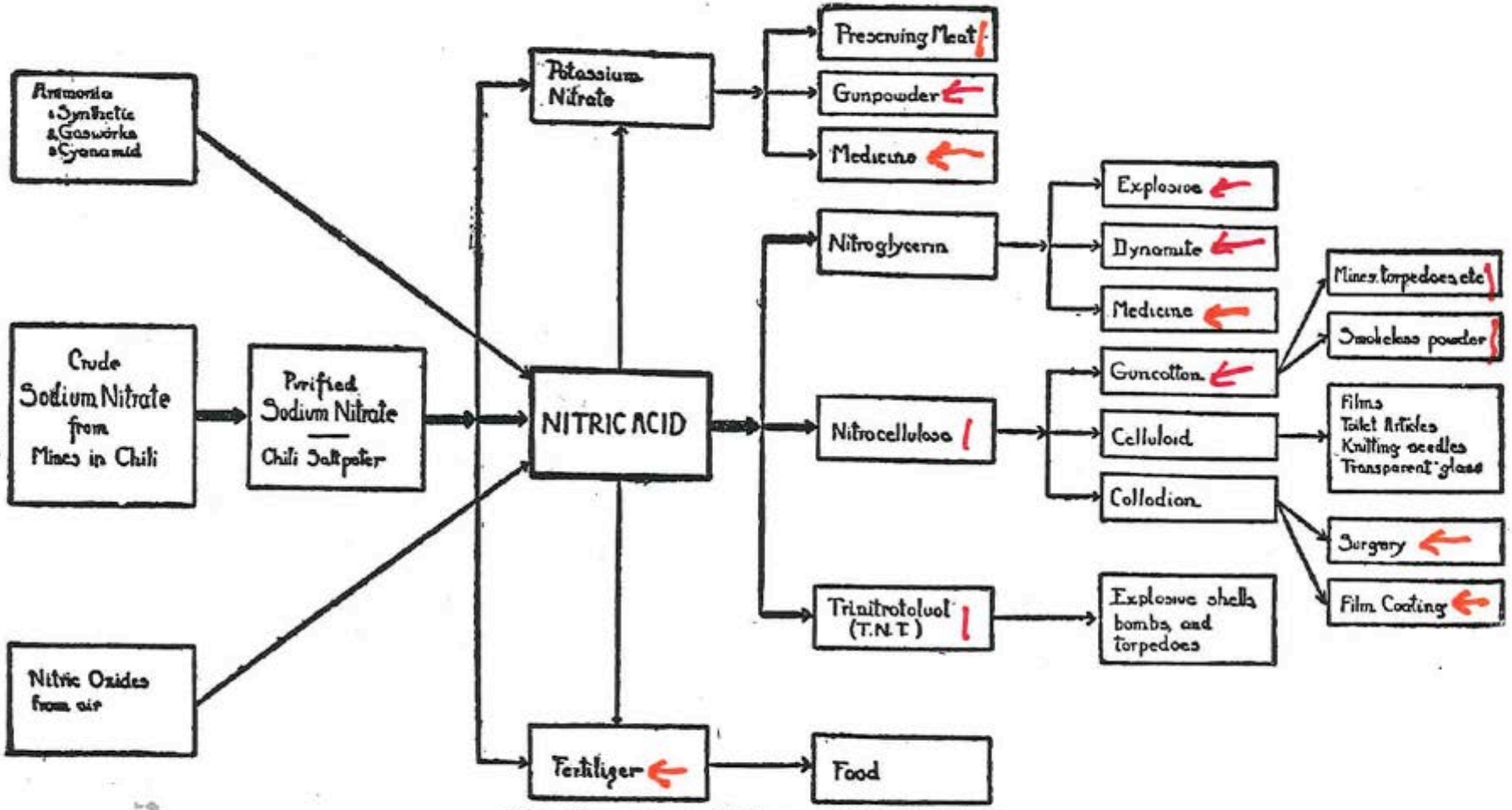
Central Powers	Allies
N fixation (Haber, arcs...)	optical glass (affected Lick, Mt. W etc)
synthetic rubber (gas masks)	dyestuffs (uniforms)
synthetic fuels	potash (fert. Germany) Urey toluene for TNT

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 natinality to serve



The Genealogical Tree of Nitric Acid

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

NITROGEN FIXATION

$N_2 + O_2 \xrightarrow{\text{(lightning, Schonherr process, Birkeland-Eyde, Pauling)}} 2\,NO + \text{atm } O \longrightarrow 2NO_2$ (arc)

$H_2 + 3H_2 \xrightarrow[(U)]{} 2\,NH_3$ (Haber)

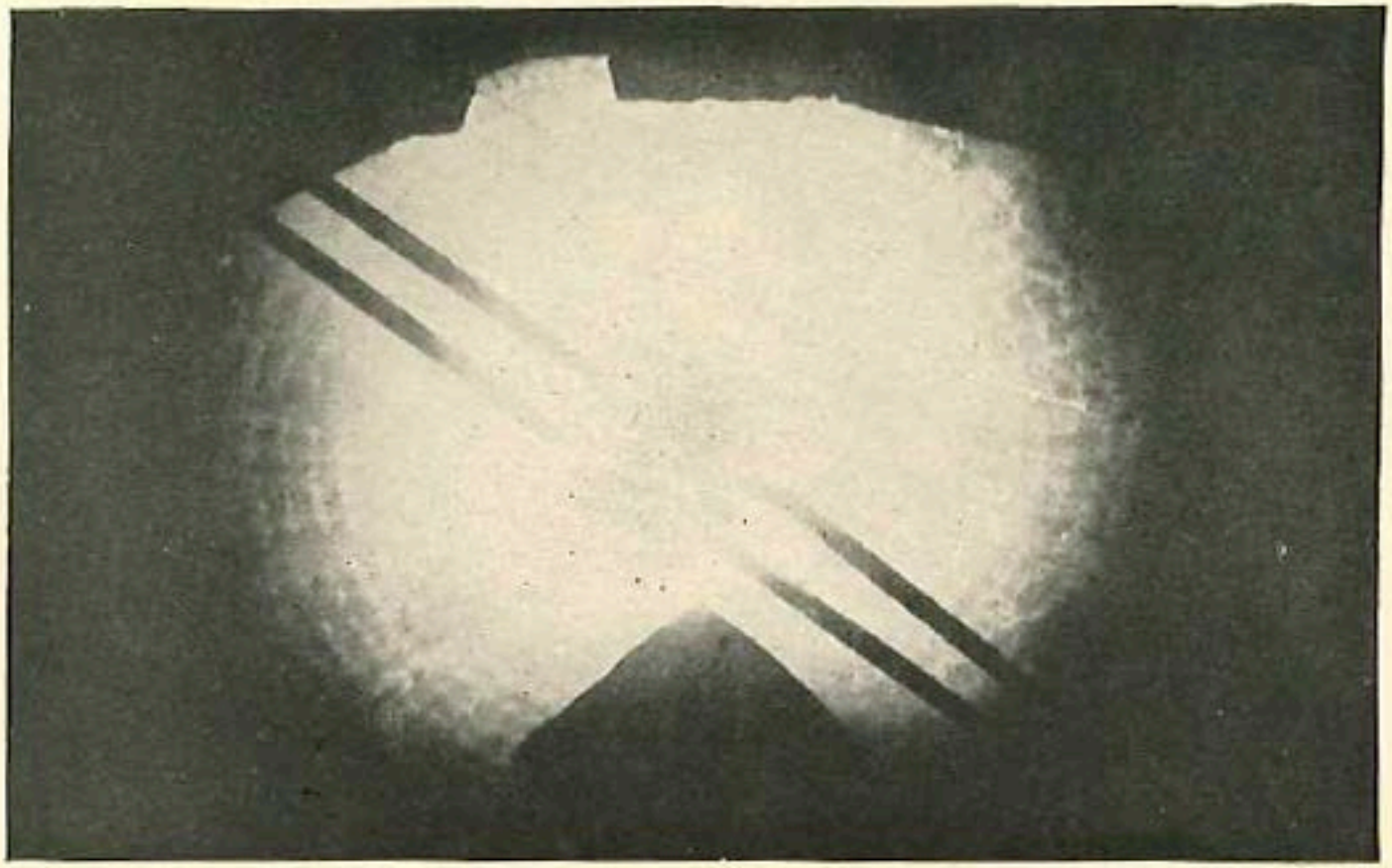
$NH_3 + 2O_2 \xrightarrow[(Pt)]{} HNO_3 + H_2O$ (Ostwald)

$CaC_3 + N_2 \longrightarrow CaCN_2 + C$ (Cyanamid)

$CaCN_2 + 3\,H_2O \longrightarrow CaCO_3 + 2NH_3$

and others

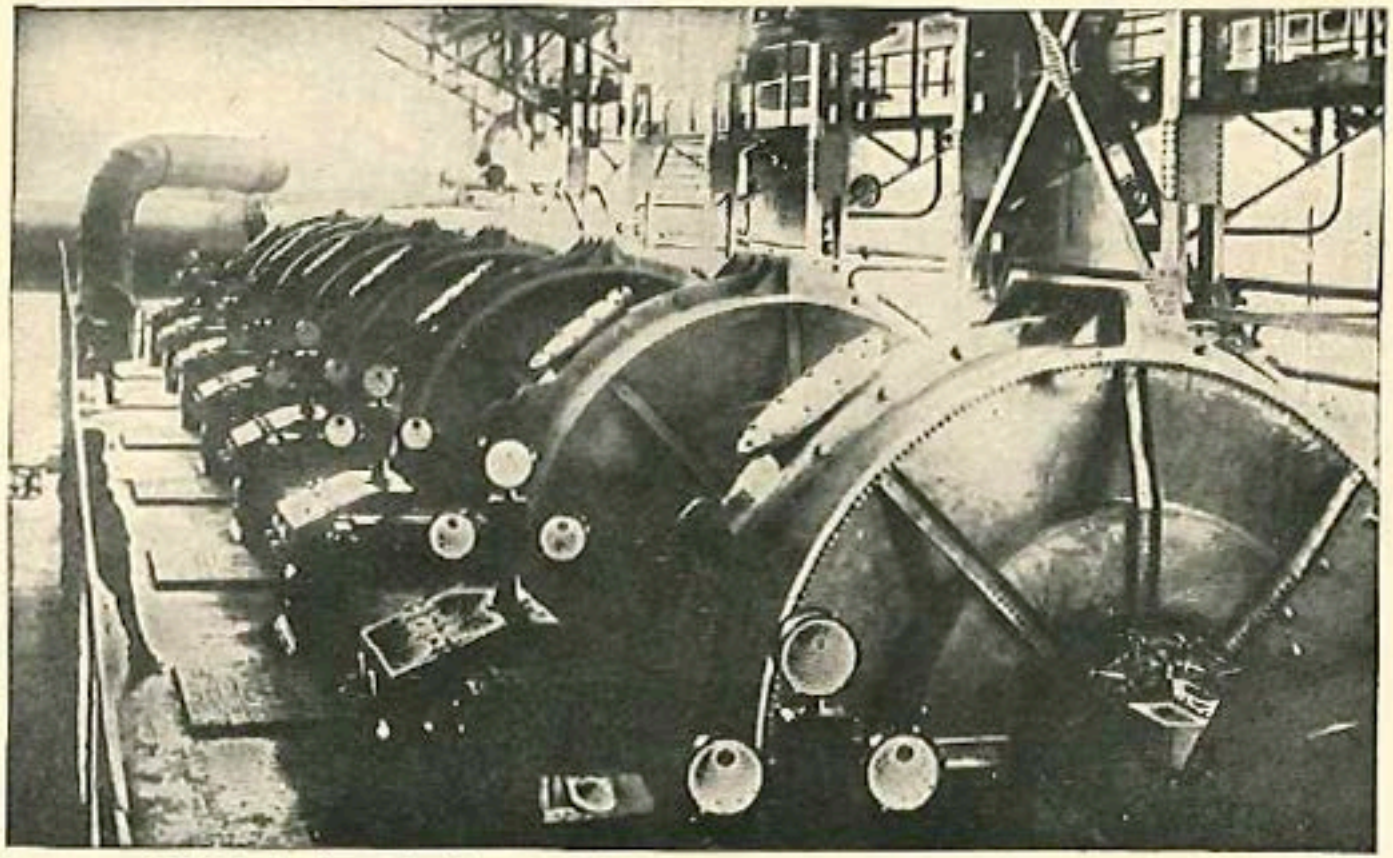
Postwar, German chemical patents to Allied Property Custodian (also Jahrsberichte) to Chemical Foundation (4500)



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

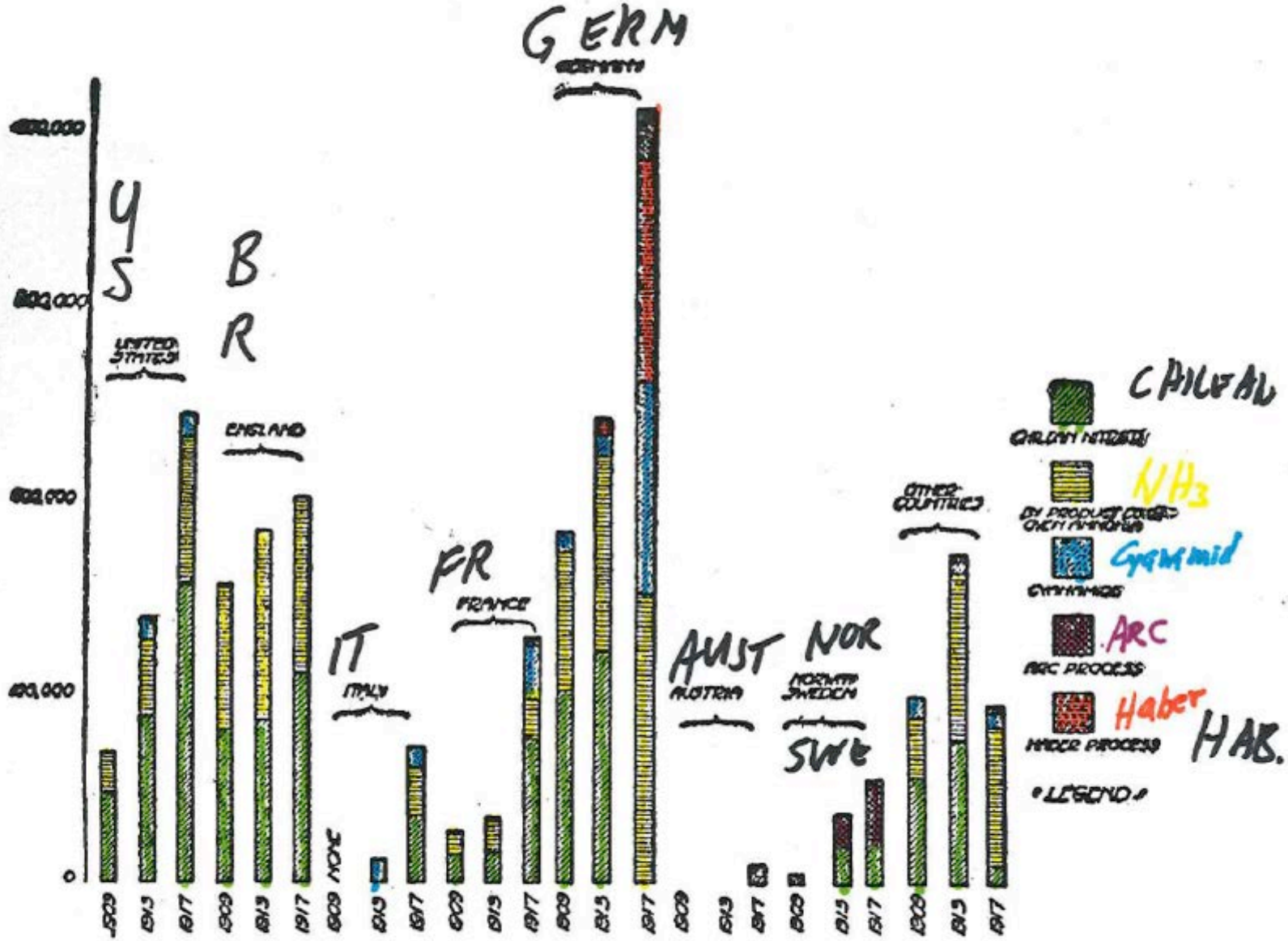
BURNING AIR IN A BIRKELAND-EYDE FURNACE AT THE DU PONT PLANT

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.



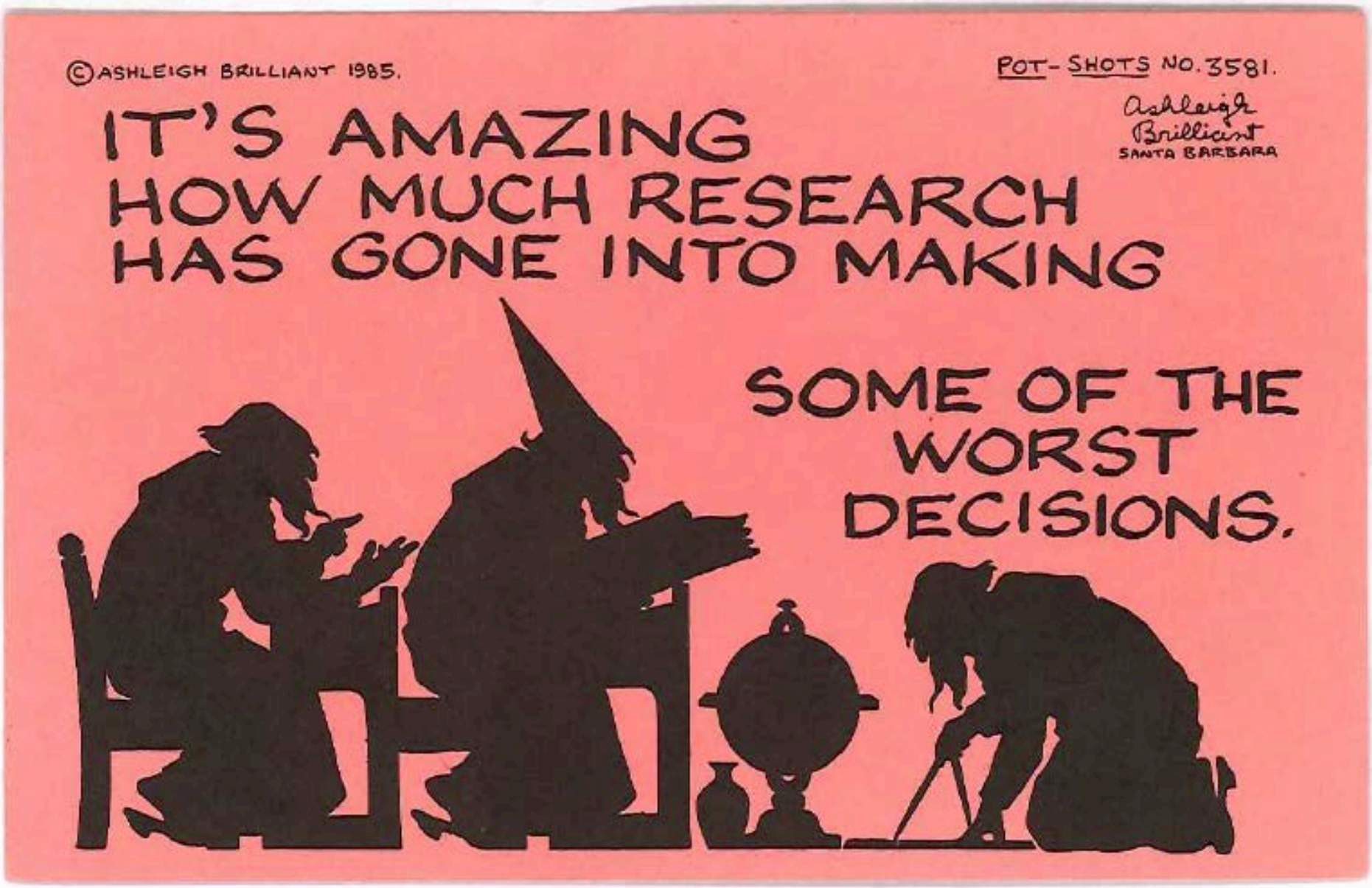
Courtesy of E. I. du Pont de Nemours Co.

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.

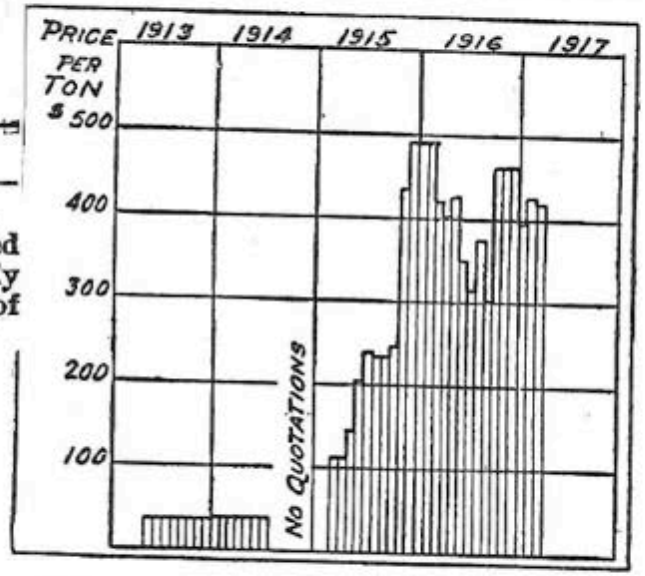

©ASHLEIGH BRILLIANT 1985.
POT-SHOTS NO. 3581.
Ashleigh Brilliant
SANTA BARBARA
IT'S AMAZING HOW MUCH RESEARCH HAS GONE INTO MAKING SOME OF THE WORST DECISIONS.

PRODUCTION OF POTASH IN THE UNITED STATES

Source	1916 Tons K_2O	1916 Per cent. of total production	1917 Tons K_2O	1917 Per cent. of total production
Mineral sources:				
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 furnaces			185	0.6
Organic Sources:				
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 refineries			369	1.1
Miscellaneous industrial wastes	63	.7	305	1.0
Total	9,720	100.0	32,573	100.0

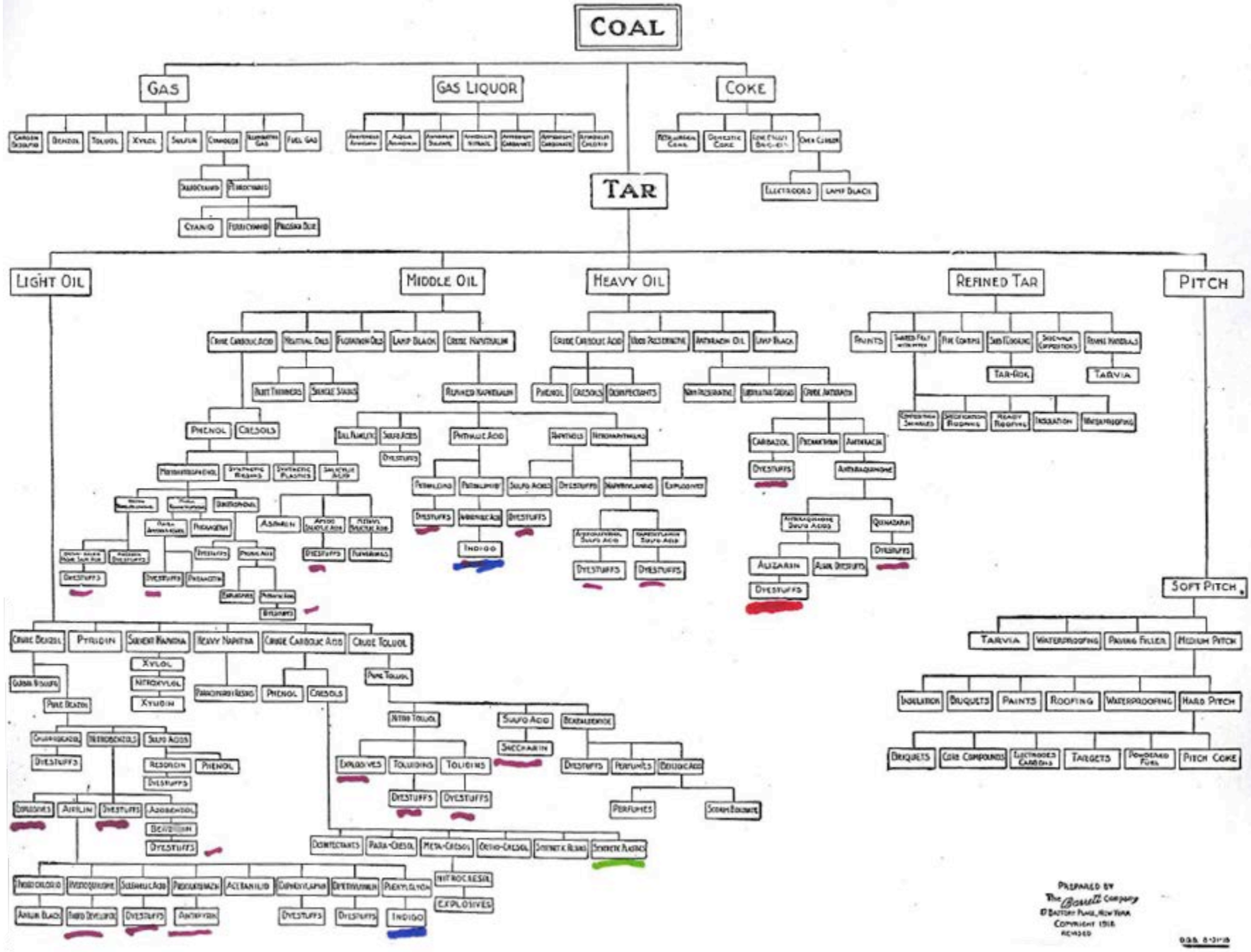
—From U. S. Bureau of Mines Report, 1918.

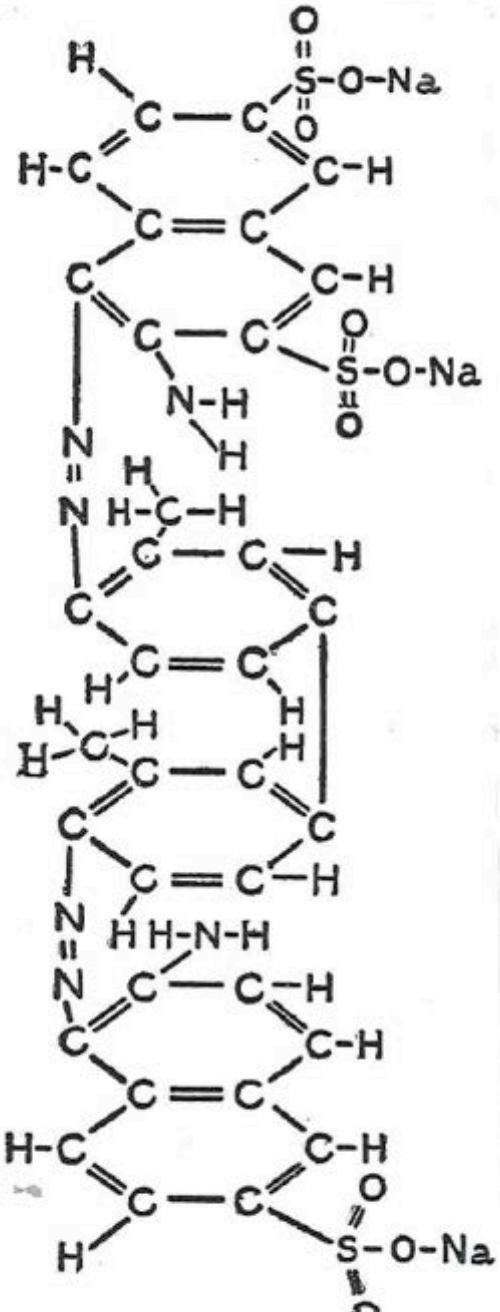
This table shows how inadequate was the reaction of the United States to the war demand for potassium salts. The minimum yearly requirements of the United States are estimated to be 250,000 tons of potash. 1919



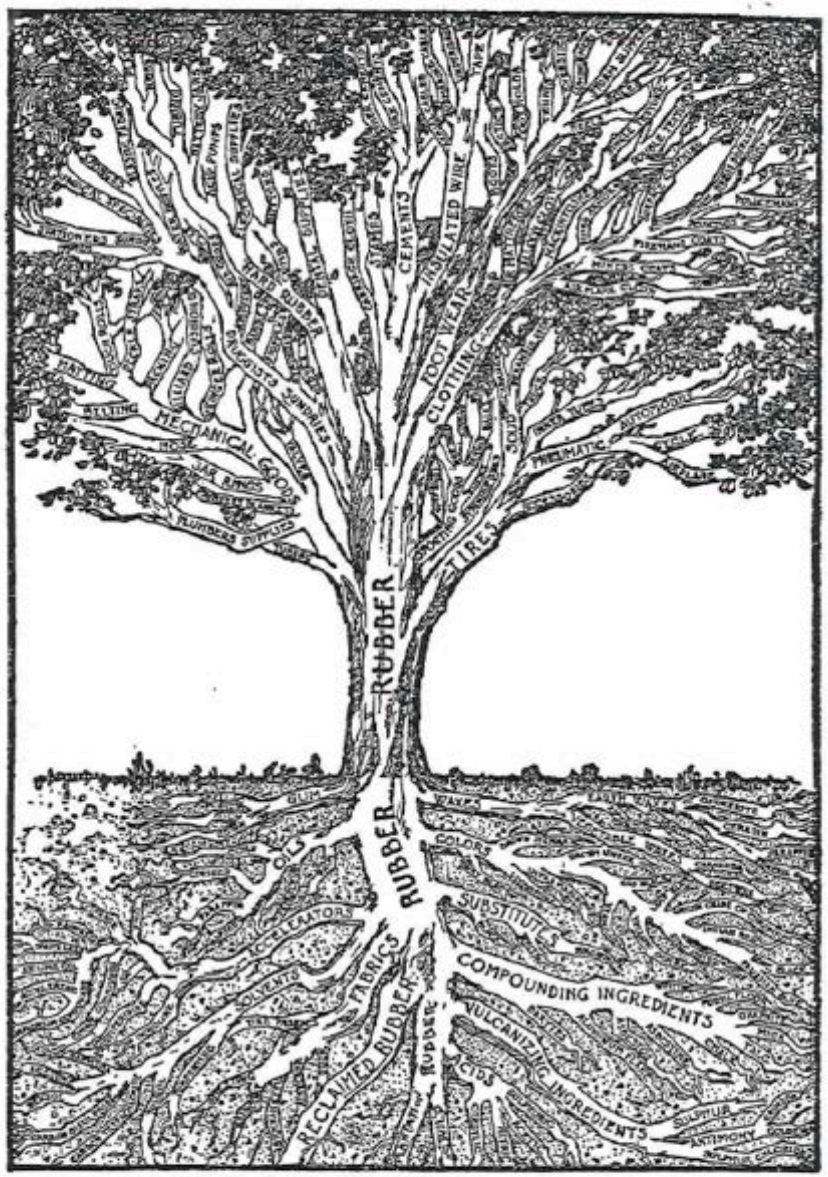
What happened to potash when the war broke out. This diagram from the *Journal of Industrial and Engineering Chemistry* of July, 1917, shows how the supply of potassium muriate from Germany was shut off in 1914 and how its price rose.

PRODUCTS DERIVED FROM COAL





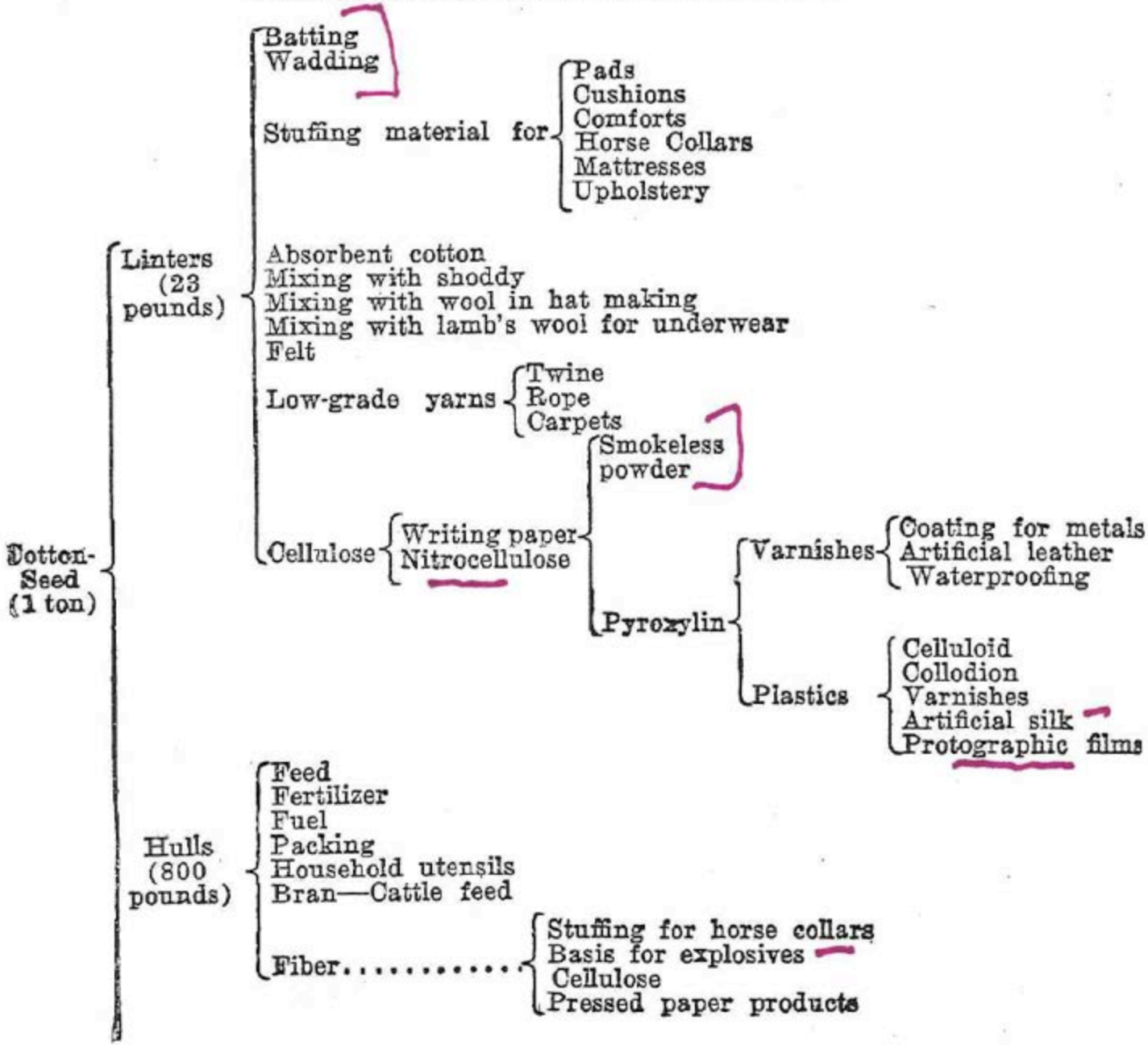
A molecule of a coal-tar dye



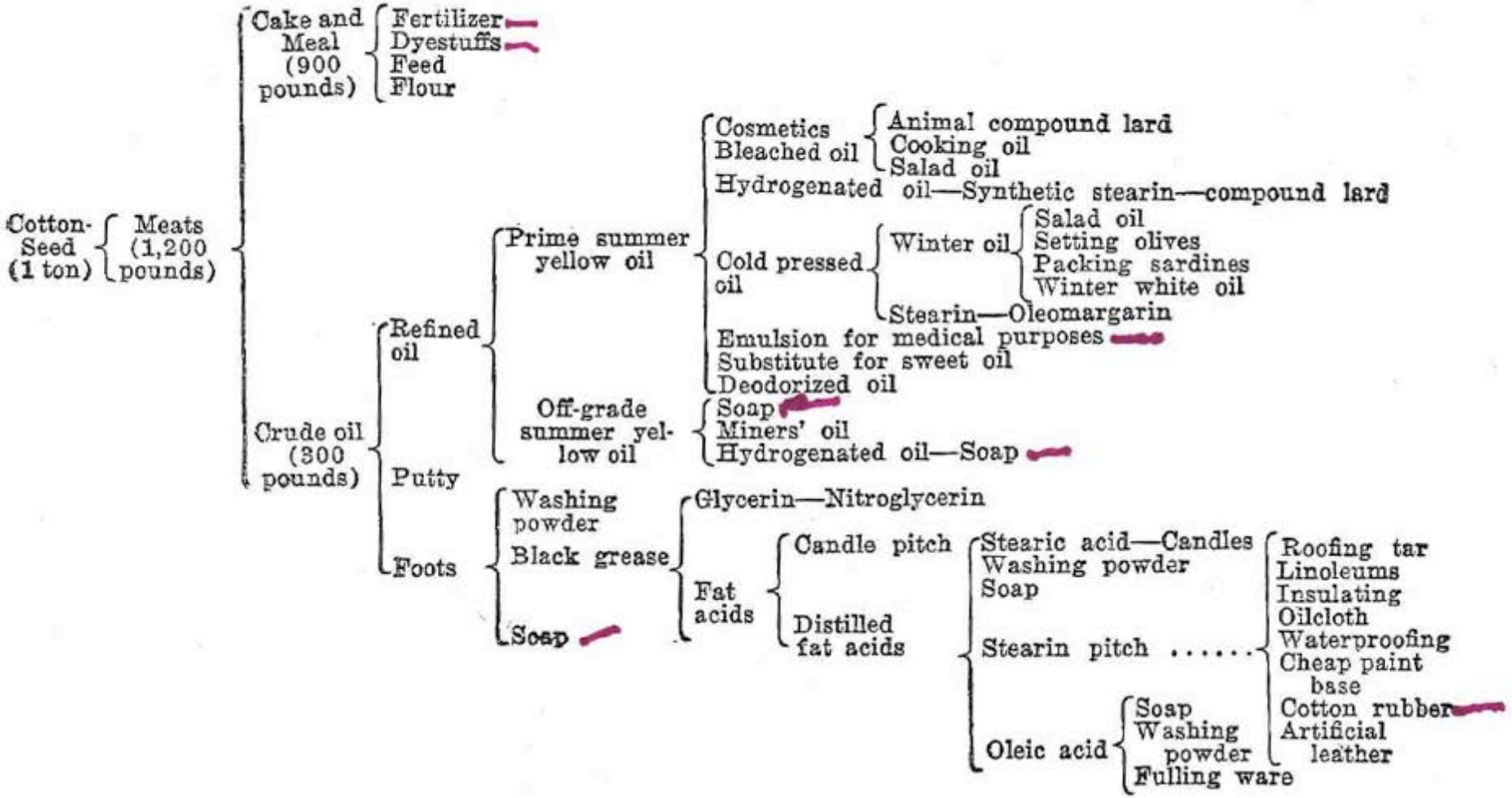
Courtesy of the "India Rubber World."

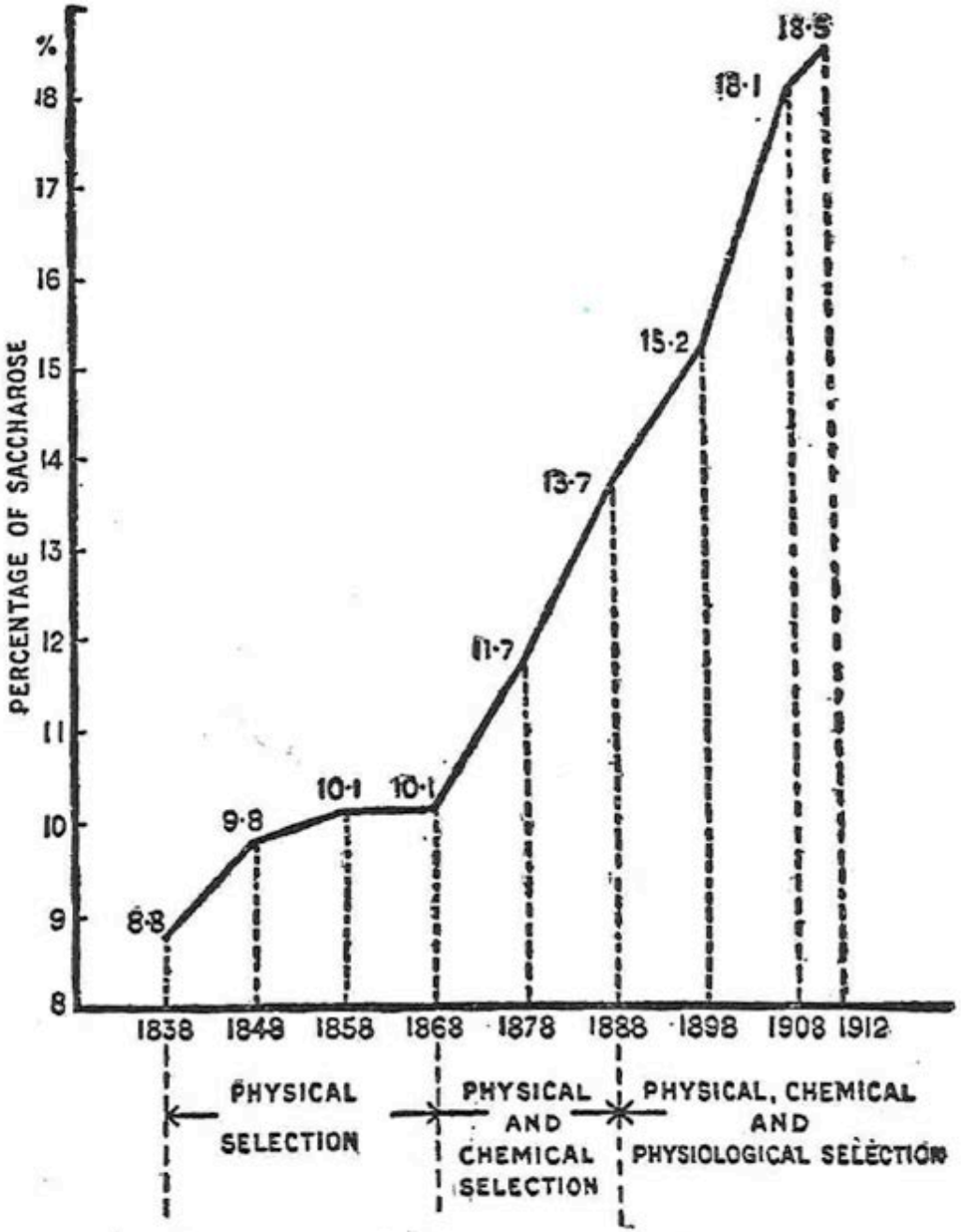
What goes into rubber and what is made out of it

PRODUCTS AND USES OF COTTONSEED

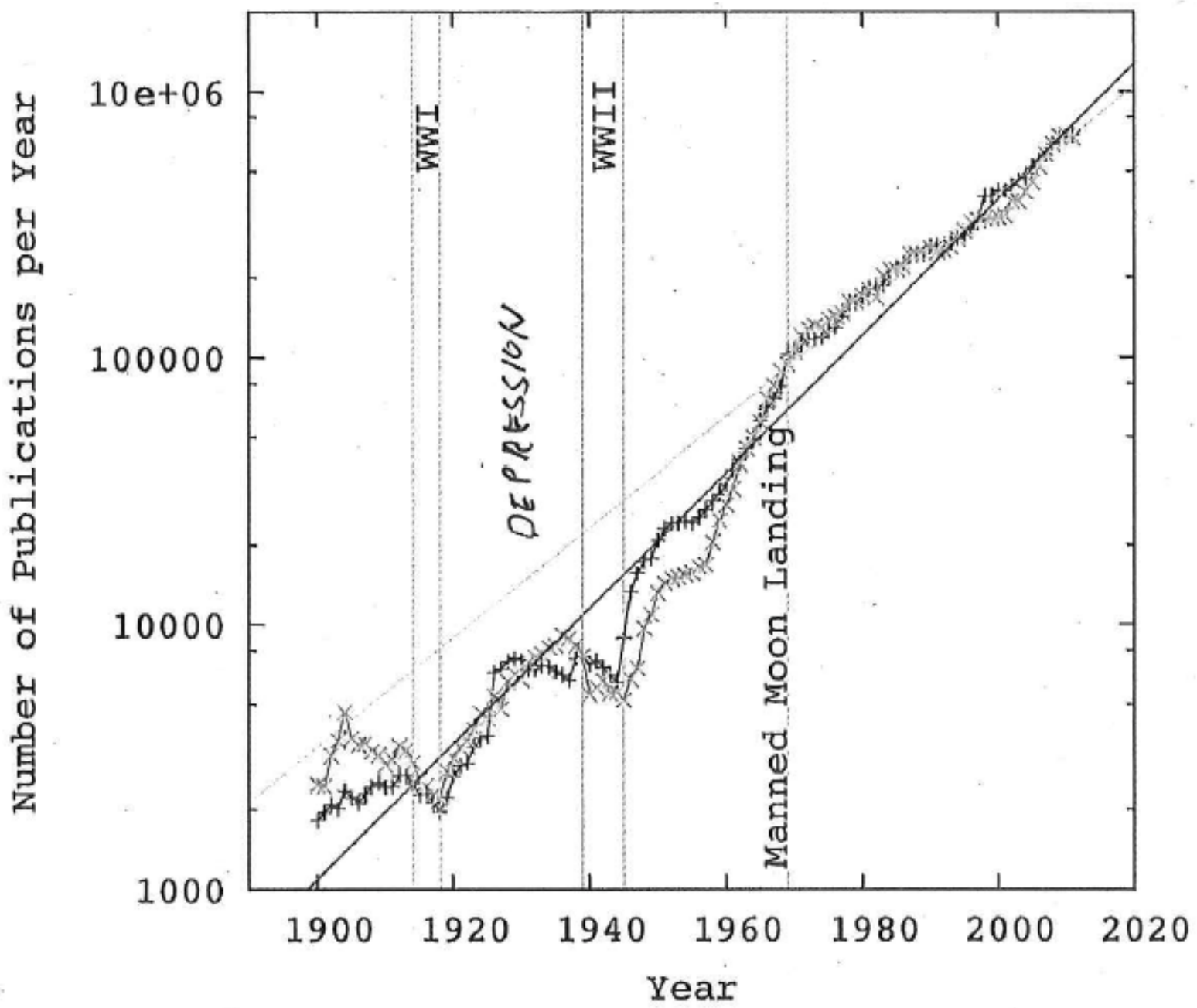


PRODUCTS AND USES OF COTTONSEED—*Continued*





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


Number of Publications per Year
10e+06
100000
10000
1000
1900
1920
1940
1960
1980
2000
2020
Year
WWI
WWII
DEPRESSION
Manned Moon Landing

PRE- GREAT WAR INTERNATIONAL COOPERATION

Gesellschaft Katalog, 1868
Cartedu 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
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, mustic festivals
International Sanitary Convention 1892
International List of Causes of Death 1893

Group photograph of the fifth and last Conference of the International So 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 Comn tee of the Solar Union consisted of A. Schuster, G.E. Hale, and K. Schw schild. The latter died during the war. The Solar Union ceased to exist a the war when Schuster and Hale decided to abolish it because its activiti 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 recoevered. Other German expeiditions 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 July30, Bonn, International Solar Union (exec comm A Schuster, Hale, K. Schwarzschild)

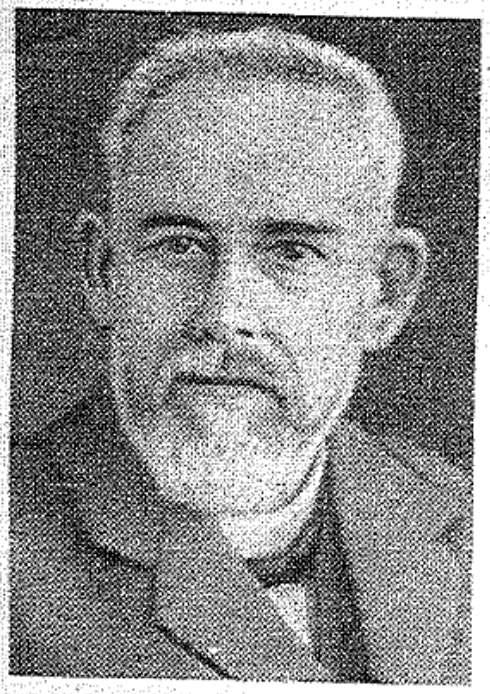
Born Bebrich (Hessen), Germany, 29 May 1885
Died Wiesbaden, Hessen, (Germany),
24 July 1964

Freundlich, Erwin. Reproduced by permission of D. B. Herrmann, 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
RAS 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)

Abetti Ir 1882 ????
Ainsley Br 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 evesdropping on radio communications (MET)
Astron Vr 1877 enhancing airplane fabric & webbing @ Royal Aircraft Estab. Farnsborough
Atkinson Br 1898 No? RAE W
Baade 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)
Bayer, Max Ger 1894 served in both WW
Banachiewicz Poland 1882. no(?)
Barnard US 1857 apparently got to France 1917 or so to speak at Paris acad sci, mdeal winner
Bigourdan Fr 1851. Time service of Paris observatory under Baillaud. Was often only astr. speaker at sessions of Paris Acad 1914–18
Bjerknaes Nor 1862. Chair at Leipzig 1912–17
Blackett Br 1897 @Dartmouth Naval Lag 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
Blagg, Mary Br. 1858. carried for Belgian refugee children during WWII, 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 Lodz)
(Campbell, WW was on 1914 Lock eclipse expedition to Russi)
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 (MET)
Charlier Sw 1892. Member of Board of Astron. Gessell. 1904–23
Coblentz US 1873 at NBS in charge of radiometry 1905–45
Comas Sola Sp 1868. Contributed observations regularly
Compton US 1892. 1917–18 @ Western Electric Company Westinghouse (one ofmany large companies that turned their research labs partly to war work)
Comrie NZ 1883. NZ Expeditionary Force in Fr, lost leg (WWII scientificcomputing services supported Br military operations)
Cosserat Fr 1866 director @ Toulouse 1908 to death; completed their part of Carte du Ciel
Cowell India 1870. director of Nautical Almanace Office ROG 10–30
Crommelin N. Ireland 1865. At RGO
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
Danjon Fr 1890 assigned to sound ranging service; lost one eye in combat in Campaign region croix de guuerre & Legion d'Honeur 1915, under Escanglon
Delporte Belg 1882. Uccle, but ????
Denning Br 1844. MAJOR contributor of comets, meteors, etc to Nature astronom ycolumn
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
Dziewulski 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)
Evershed Br 1864 director at Kodaikanal & sent back many observations
Fabry Fr 1867 head of Physical Section of Service of Invention, rcd. 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

2

Fox US 1878 2nd lt. Sp-Am War; WWI vol. major infatry, to lt. col. asst. chief of staff of 7th infantry in France, recalled 1940 full col. w/ Army Electronics Training Center at Harvard
Freundlich Ge 1885 1914 eclipse exped from Berlin to Crimea for Aug 21 solar eclipse, captured & internedby 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 MNSW WEA
Gerasimovich Ru 1889. ??? 1914–17 gap in biography
Grubb, H. Br 1844 Ireland. 1914 civilian work on telescopes topped & factory moved from Dublin toSt. Albans for security
Guthnick Ger 1879 ??
Hagihara 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 Br. So Af 1837, Col (retired)
Hertzsprung DK 1873 at Potsdam 1909–19
Hess Austria 1883, Inst for radium research
Hinks 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 statistcis)
HirayamaJpn 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 shotting
Humason US 1891 ——
Hulbert US 1890 Signal Corps, to capt.
Humphreys US 1862 weather bureau
Ingalls US 1898 "served"
Innes Scot 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
Jonckheeren Bel 1888 displaced to England 1914, optical service of Royal Arsenal
Joy US 1882... MET
Kaluza 1885 Pol/Ger Privatdozant @ Konigsberg
Kienle Ger 1895 ??(try AN 97, 99)
Klein Sweden 1894 (neutral)
Kohlschutter Ger 1883 betwen MtW & Potsdam
Kolhorster 1887 Ger/Ru/Pol, measured atmospheric electricity from Turkey - POW UK
Kopff 1882 Ger. "military service"
Kulikk 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 MNSW
Luyten Indonesia 1899 student MNSW
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
Massinger (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, pilor, 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 Infrantry @ 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 Hdw
Minnaert 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 Ru 1891, 1915-17 bio gap
Milankovic 1879 A-H ??
Nordman Swits 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 Hdw
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
Peek UK 1891 Hampshire Regiment in India to major
Peltier US 1900 quit HS to take over farm when older brother to war
Peridier Fr 1881 ?????
Perrin Fr 1870 Engineering Corps, telesito meter
Pettit US 1889 drafted from Yerkes studies to Army Signal Corps, otpical measurements at JHU with Wood
Pfund US 1875 @ JHU
Plaskett HH 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 NBA & instructor @ MIT
Prager 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 187 4 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
Sanford US 1883 Dudley Obs
Saunder US 1875 1918 in DC in Milliken's group for NRC
Schlesinger US 1871. 1917 briefly aeornautical 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 GERM1873. Military service 1893-94, PhD 1891, 1914 volunteered immediately field weather station Belgium 1915, Begium, 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 commancer Italy, Hundary
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 & Slpher US. both at Lowell (1875, 1883)
Slocum US 1873 1918-20 instructor nautical science Brown
Smart Br 1889 instructor-lt @ Royal Naval College
Spencer Jones Br 1890 inspector of optical supplies for Ministry of Munitions
Stark Ger 1874 univ. spectroscopy, canal rays
Steavenson (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/Ger "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 Wilhlmshafen Naval Obs 1917-19
Struve Kharkov 1897 Imperial Russian Army 1916-
Taylor GI Br 1886 airplane propellor 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 Rhijl NL 1886 ???
Van den Bos 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
Wilson RE 1886 US, 1918 aeronautic engineer of Bureau of aircraft production
Wirtz Ger 1876 Germ Army 1916-18, lostright to teach 1937
Wolf of W-R, Fr 1927, retired 1901, returned to home town in Fr, forced to leave when Ger invaed, died another small French town 4 July 1918
Woltjer, J NL 1891 student @ Leiden
Zinner Pol/Ger 1886 field weather service
Zonstra NL 1894 grad in chem eng 1917

Germans, mostly young, from Sirius 48 (Mar 1915) p. 49
killed in action Liebmann (B-E), Massinger (Heidelberg), Matzdorff (Strassburg) last 2 at Ypres
PoW: Brendel (Frankfurt), KuehlMunich,12months, Sir 49, Jan, 19; FoW exchange)
Muench (Potsdam) Zurhellen (Babelsburd killed N Fran 15 July 1916 Sir 50, 146)
In service: Bauschinger (Strassburg) Boda (Frankfurt), Ebel (Kiel) Fuss (Berlin), Hoppman (Bonn), Kopff (Heidlberg), Moennichmeyer (Bonn) Osten (??), Redlich (Kiel), Rosenberg (Tuebingen) Schrader (??), Schwarzschild (Potsdam) , Werner (Koenigsberg), Zinner (Bamberg), Bottlinger in saitary service & other astronomers "in special services forthe fatherland"

From Nature: 94, 622 (1915) Croze & son of director Baillaud Paris, summoned
Pulkova, 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. Entwhistle, 2nd asst. @ Camb. killed in France

From QJRAS obits (omitting duplications and some amateurs)
Brunt in France provicing meteorological advice to Army & Royal Flying Corps, carmy commiss.
Whitehall of ROG leant to Admiralty by AR to work on submarine charts & salinity
Nassau Turkey 1893 Amer Exped Force in France
Thompson 1874 Br at naval shipbuilding yard 1906-26

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

More Germans on front lines who survived J. Hopmann, J. Hellerich

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

Band XLVIII. 1915

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.

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!

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 (Bretagne). 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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people w/ college degree became officers

UK Ditto US in WW II

batterie, Frankfurt a. M. — M. Ebell, 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 Kühl'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
u Frendlich, 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 ıe chemical elements based on their properties nd atomic numbers. Earlier versions, however, ollowed a far looser organization. In 1789, for xample, Antoine Lavoisier grouped his list of 33 lements into gases, metals, earths, and nonmetals. ut chemists longed for a classification scheme ıat evinced more precision.

Dmitri Mendeleev provided a better framework ı 1869 with his precursor to our modern periodic able of elements, organizing them according to ıe sequence of atomic masses. But there were is- nes with how he chose to order the elements in his ned the atom- 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. (I also predicted tl

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 Forscher Schwarzschild näher zu kennzeichnen[1]). 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 Astronomie 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

[1]) 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 !

Zwölf Monate in russischer Gefangenschaft.[1])

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 Zirkulare, 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

[1]) 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.

la eclipse (3 parts) Sirius 49 (1916) p49

+, 2 more parts

The first General Assembly of the IAU, held at Rome from 2 to 10 1922. In the President's chair: B. Baillaud. On his right hand, in this General Secretary A. Fowler, R.G. Aitken, R.P. Cortie, and C.E. St. on his left hand: Vice-President F. Dyson, P. Stroobant, G. Bigourdan of the Bureau de l'Heure), G. Armellini, Ch. Lallemand (President of International Union for Geodesy and Geophysics), and H. Deslandres (IAU Vice-President 1922–1928). Behind-in between Baillaud and Dyson: E. Strömgren (Copenhagen, Head Central Bureau for Telegrams). (For more identifications, see Bull. Soc. Astron. de France, September 1922, p. 369.) (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-Pluvinel),
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, Vera Rubin, VT, Elaine Sadler Françoise Combes
No. 29, Spectral Classification (W.S. Adams),
No. 30, Stellar Radial Velocities (W.W. Campbell),
No. 31, Time (R.A. Sampson),
No. 32, Calendar Reform (G. Bigourdan).

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 dissimination 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 Einste (1879–1955), photographed around 1933. (Archives Lemaître, Université Catholique Louvain.)

Sartorial assistance needed. Post-WW1 stories

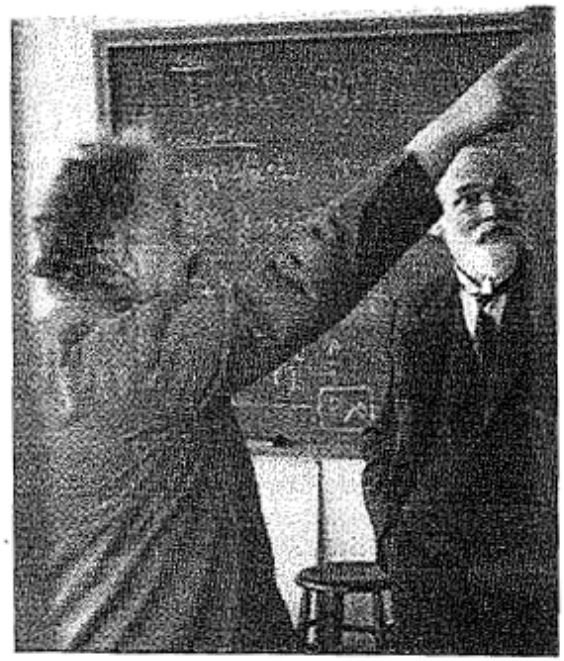


Fig. 14.1 Einstein and de Sitter. Photographed 8 January 1932 at

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

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

ЭЙНШТЕЙН 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 inoculars 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 Gibralter & 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 Raines, 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 Trimbles fought ~~on~~ US ~~1~~, ever (careful choice of birth years, places, & skills) Aver. 1721

SSPL/GETTY

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.

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.

Kunstmuseum Bern

Félix Vallotton: The Rape of Europa, *1908*

Musée de l'Armée, Paris

Félix Vallotton: Verdun, *1917*

DON'T MISS: JULY 26-AUG. 1

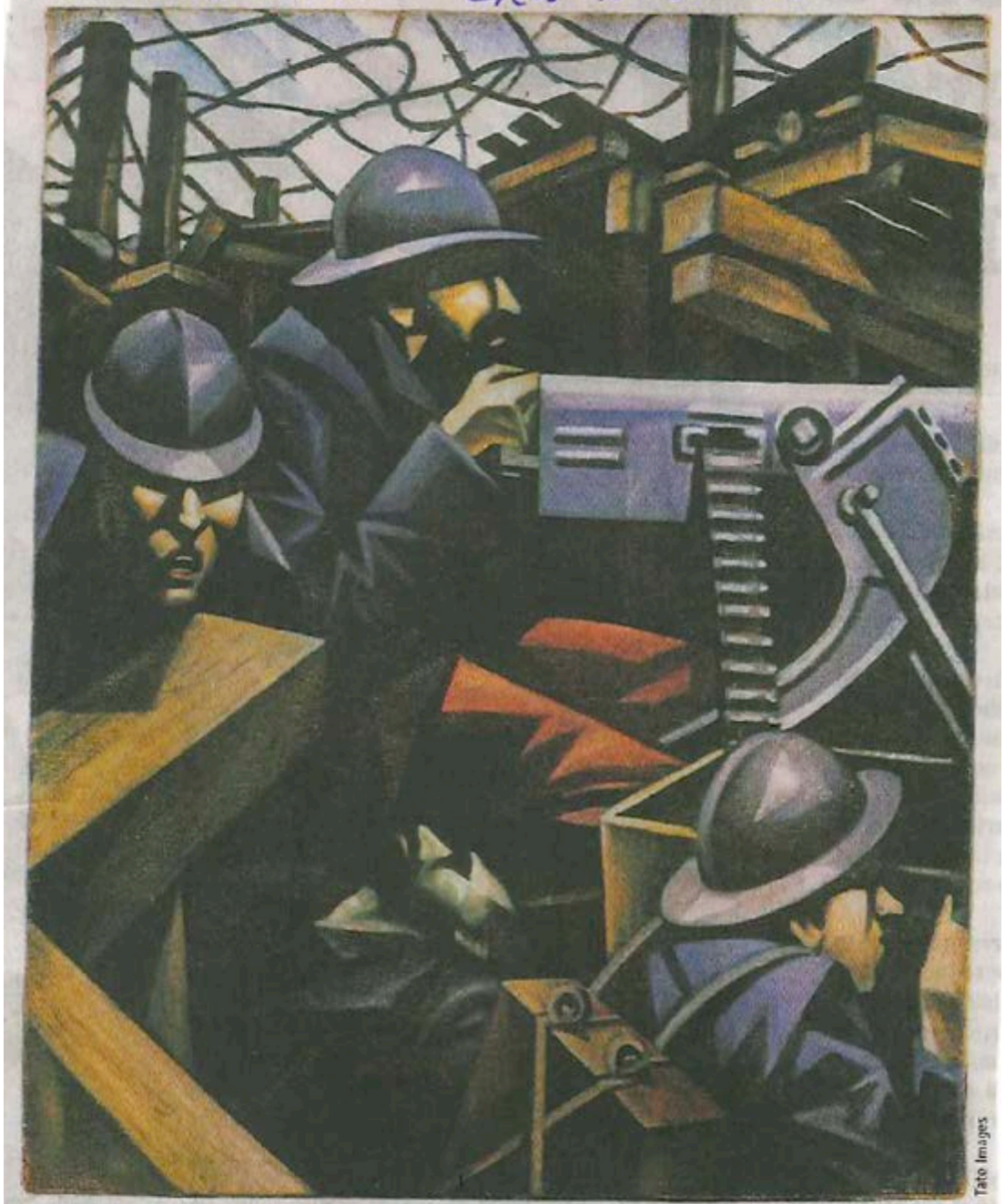
The Art of War

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 CRW 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.

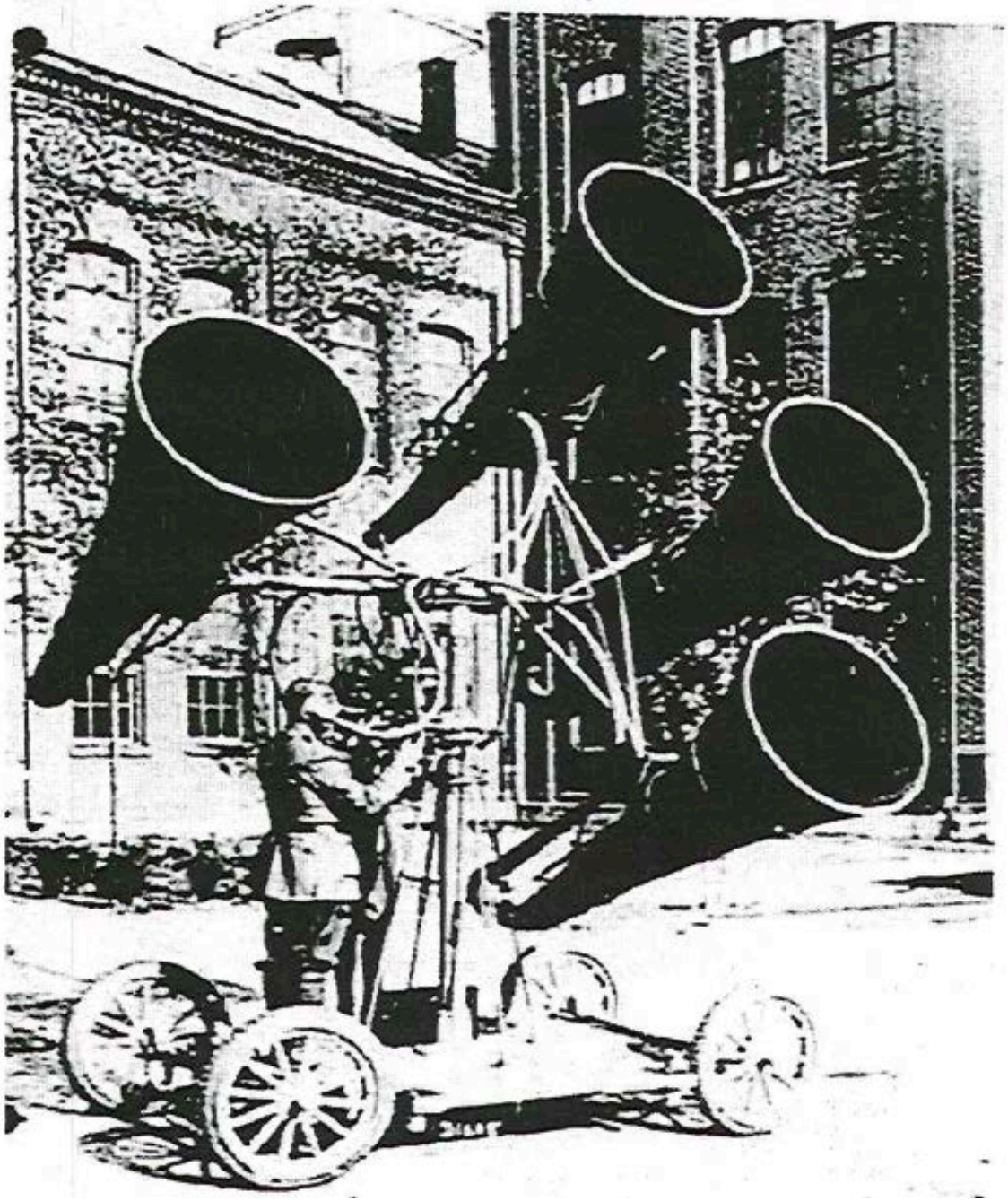
POT-SHOTS NO. 3343.

Ashleigh Brilliant

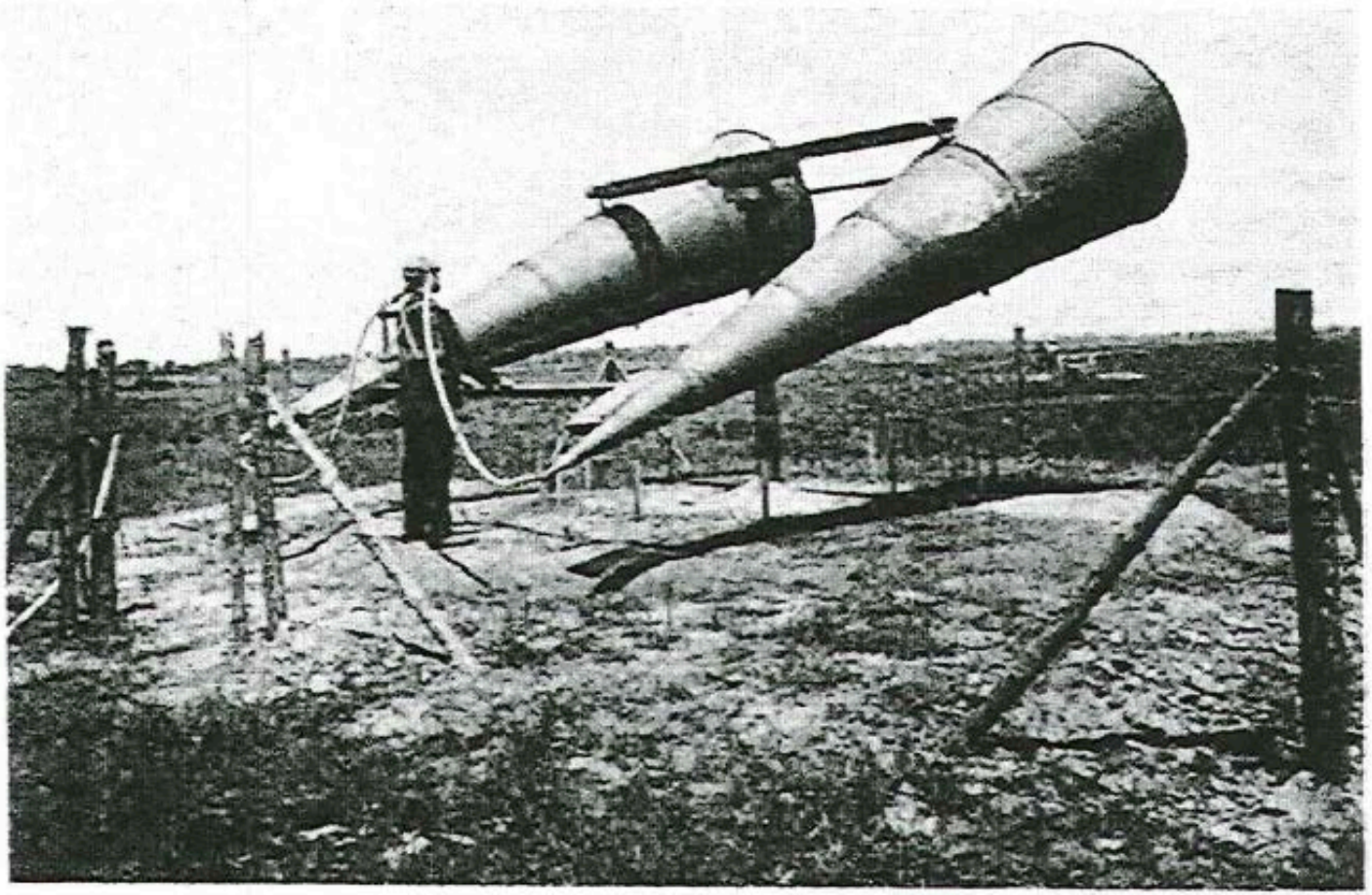
IF I HAD MORE SKILL IN WHAT I'M ATTEMPTING

I WOULDN'T NEED SO MUCH COURAGE.

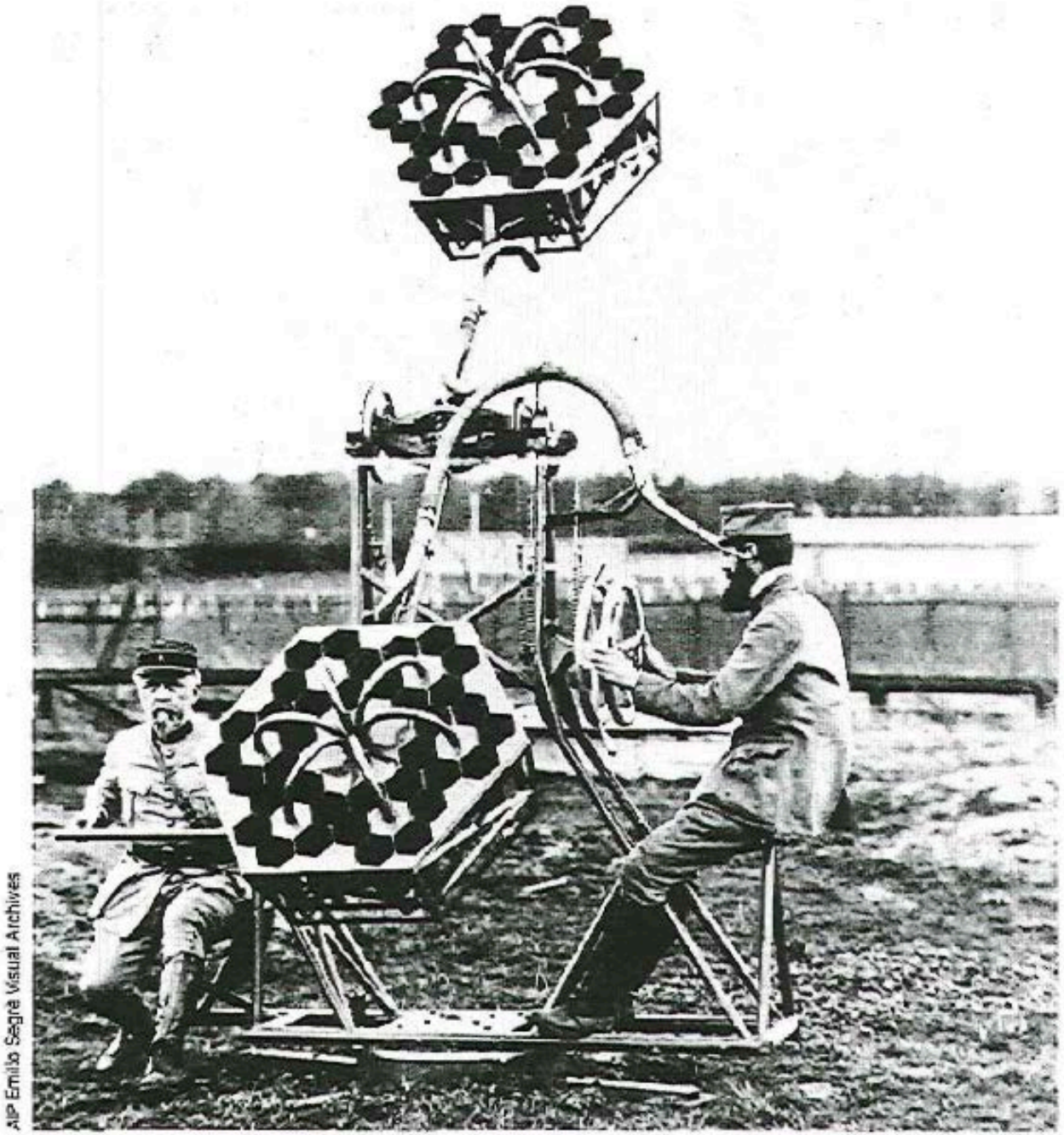
Aircraft Detection Horns, WWI Mobile Version



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).



AIP Emilio Segrè Visual Archives

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

FRONTISPIECE.

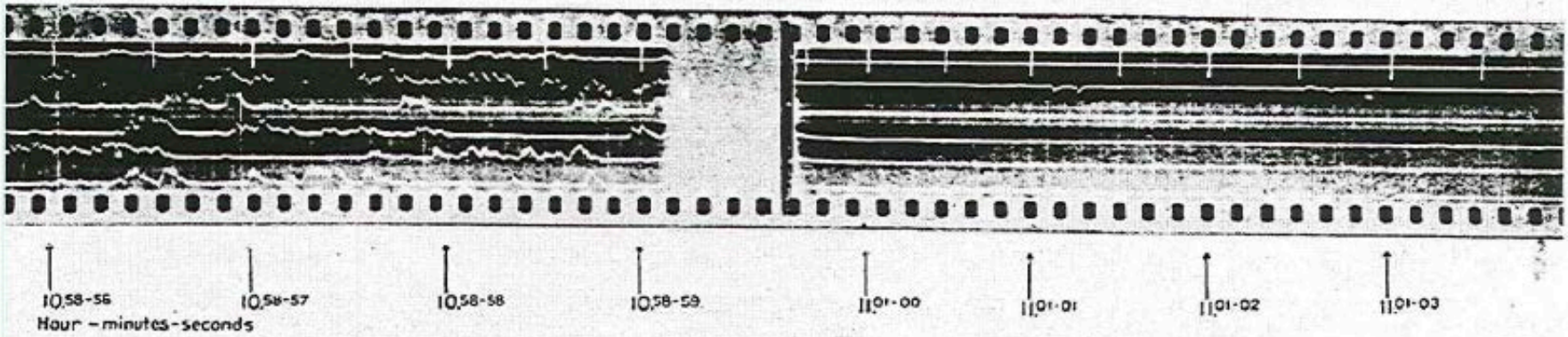
"THE END OF THE WAR."

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

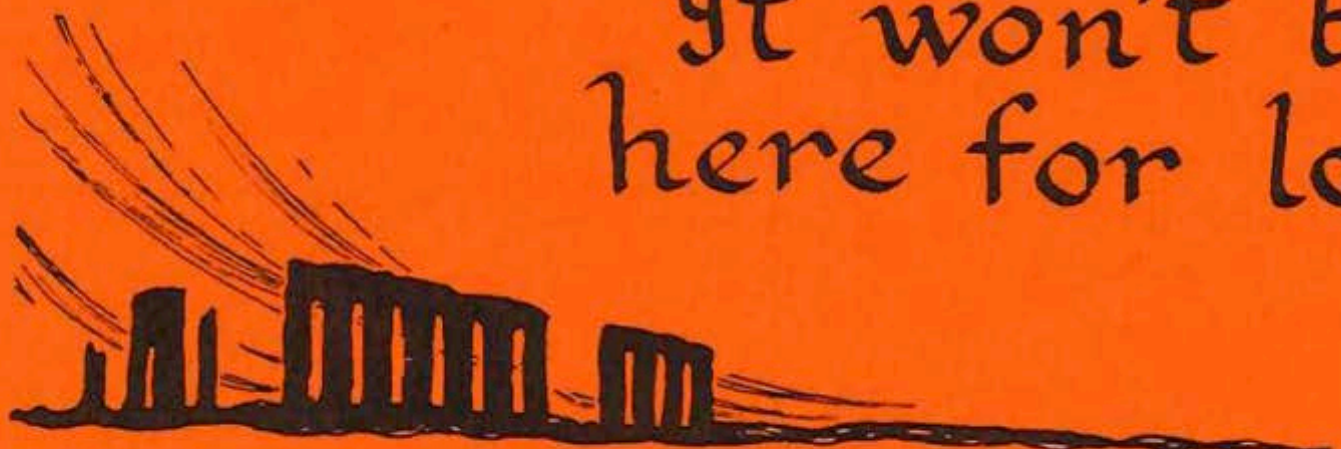
Non-English literature? Hilmar Duerbeck culled Sirius (d. Jan 2013). Cull Naturwissenschaftern (much less forthcoming than Nature about deaths, supply problems....?) Russian? Not sure what exists (& Meinhard Meyer d. 2012)

Collaborators in good health welcome!

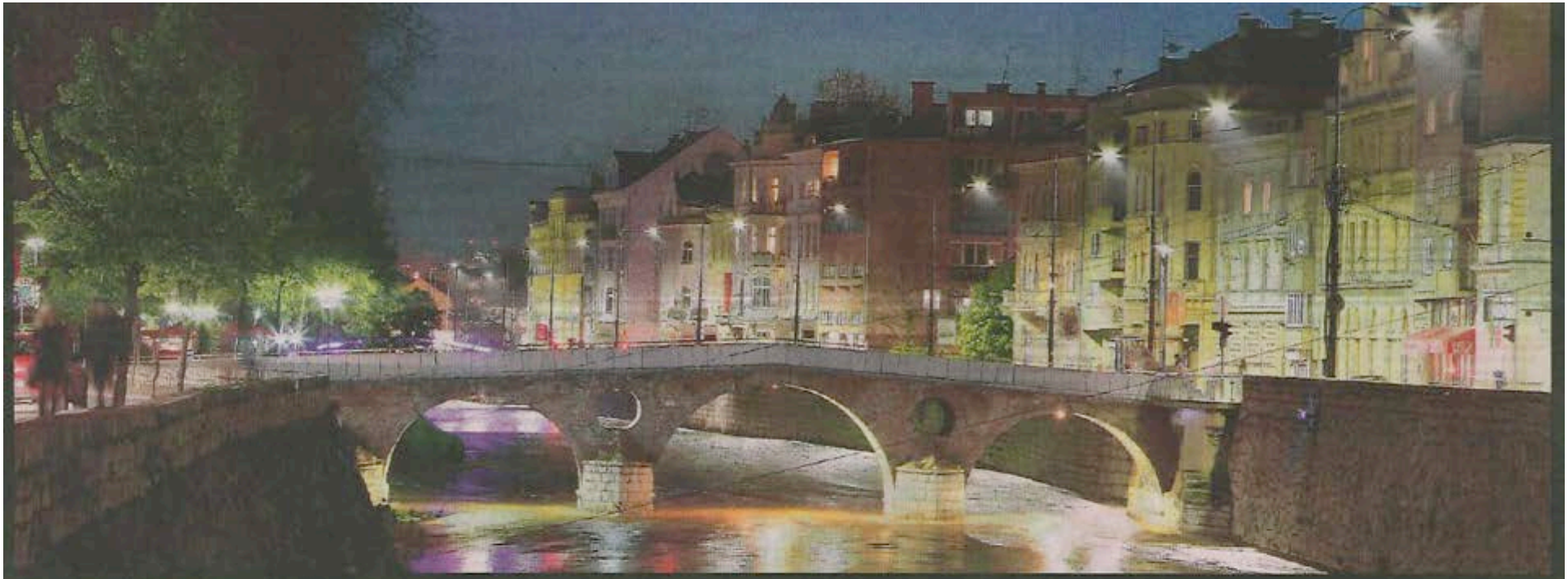
POT-SHOTS NO. 1181

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**

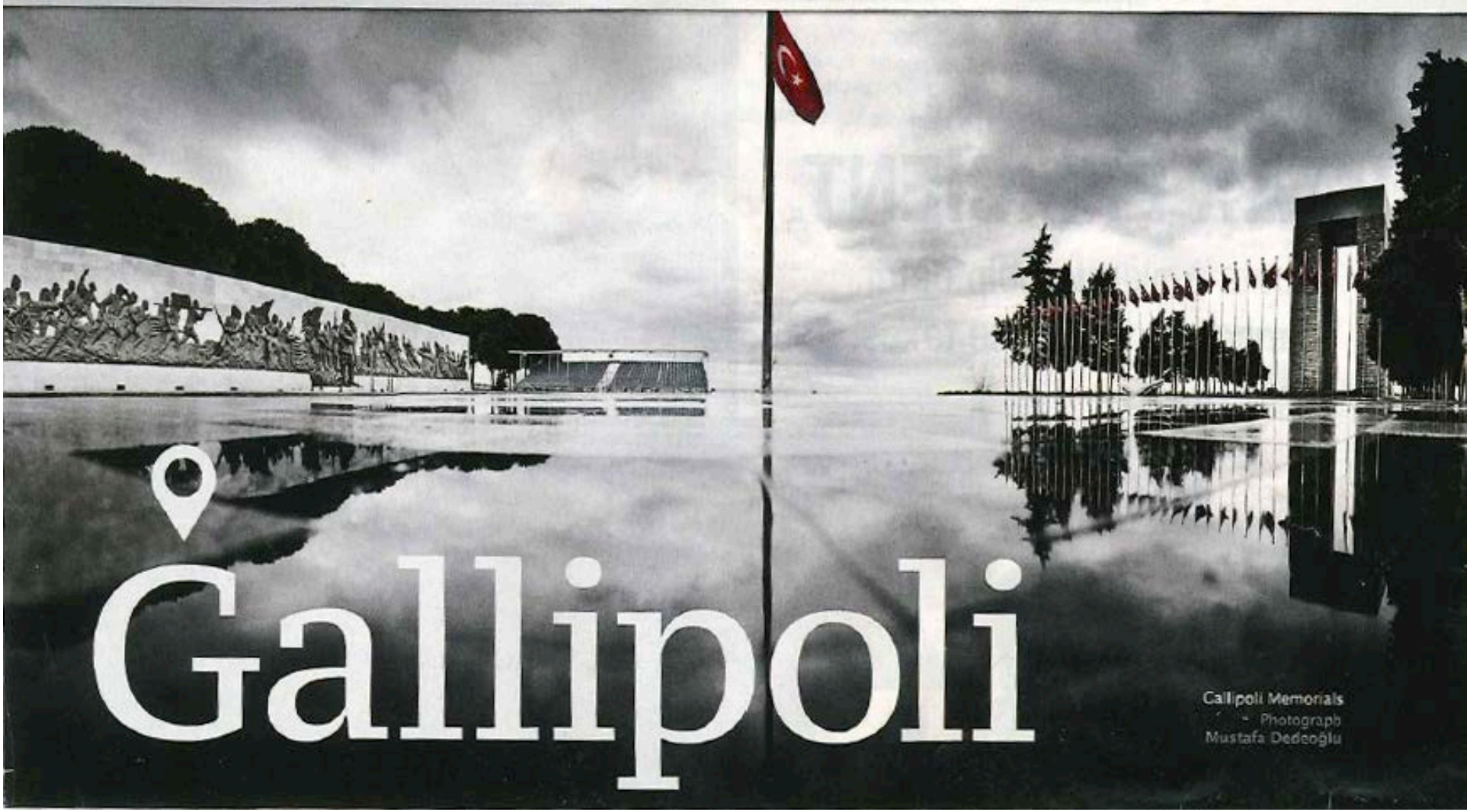
YPRES

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

POT-SHOTS No. 3877.

THE ONLY REQUIREMENT FOR EVENTUALLY GETTING THERE

IS TO KEEP GOING IN THE RIGHT DIRECTION.