No One Asked for Plastic
Plastic production just keeps expanding, and now is becoming a leading cause of climate change.

Rebecca Altman
The Atlantic, January 2022
*Edited by Sarah Laskow
**Fact checked by Sam Fentress

The published text is hyperlinked, where possible. But here are additional specifics on those sources in addition to others consulted during the writing of this essay and the larger book project from which this essay draws (tentatively titled *The Song of Styrene: An Intimate History of Plastics,* forthcoming from Scriber Books (US) and Oneworld (UK).

Acknowledgments

Kind thanks to Kathy Hipple, Ted Schettler, Carroll Muffett, Steven Feit, Diane Sicotte, Chelsea Rochman, Peter J.T. Morris, Jeff Meikle, Judith Enck, Gregg Mitman, Jared Rhodes (Director of Policy and Programs, Rhode Island Resource Recovery Corporation), Johnathan Berard, Bathsheba Demuth, and Charles Gasior for consulting with me on various subjects relevant to this project. At *The Atlantic*, special thanks go to Sarah Laskow, who commissioned this piece by asking: "why is it so hard to break up with plastics?" And then so deftly saw it (me) through multiple developmental edits. Sam Fentiss is a most thorough and engaging and deeply appreciated checker of facts.

Also, to the dedicated archivists at: the Library of Congress, the Smithsonian Museum of American History, the Hagley Museum and Library, the Science History Institute, the West Virginia State Archives, the South Charleston Interpretive Center, Carnegie Mellon Institute Archives at Carnegie Mellon, The University of Iowa, The FDR Presidential Library (Collection on the Rubber Survey Committee), Bergen Grant (Boston University), and for the personal collections shared by Kim Johnson.

On plastics additives:

Helene Wiesinger, Zhanyun Wang, and Stefanie Hellweg. 2021. Deep Dive into Plastic Monomers, Additives, and Processing Aids**.** Environmental Science & Technology 2021 *55* (13), 9339-935. **https://pubs.acs.org/doi/full/10.1021/acs.est.1c00976**

From abstract: "In total, we identify more than 10,000 relevant substances and categorize them based on substance types, use patterns, and hazard classifications wherever possible. Over 2,400 substances are identified as substances of potential concern as they meet one or more of the

persistence, bioaccumulation, and toxicity criteria in the European Union."

On scale of US contribution to plastic pollution:

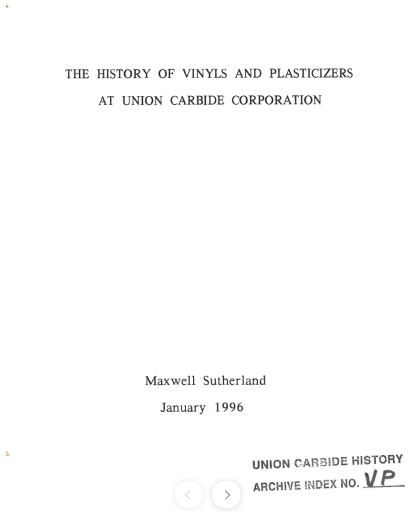
See The National Academy of Sciences, Engineering and Medicine. 2021. Reckoning with the U.S. Role of Global Ocean Plastic Waste. Washington DC, The National Academies Press. https://www.nap.edu/resource/other/dels/plastics-in-the-ocean/

Matthew Savoca, Anna Robuck and Lauren Kashiwabara. 2021. Plastic Trash in the Ocean is a Global Problem, and the US is the Top Source – A New Report Urges Action. *The Conversation.* https://theconversation.com/plastic-trash-in-the-ocean-is-a-global-problem-and-the-us-is-the-top-source-a-new-report-urges-action-172848

On the history of ethylene-derivatives, petrochemicals and plastics (including vinyls/Vinylite) at Union Carbide (previously Carbide and Carbon Chemicals):

*A note of clarification: ethylene dichloride (EDC) was technically a byproduct from Carbide's production of ethylene chlorohydrin, the precursor chemical used in making ethylene glycol (marketed as Prestone). So when I wrote EDC was a byproduct of antifreeze/ethylene glycol production, I was referring to the whole cascading series of processes that yielded Prestone (not specifically the step in the process that produced ethylene glycol).

Maxwell Sutherland 1996: the History of Vinyls and Plasticizers at Union Carbide Corp. Chemicals from Hydrocarbon Gases.



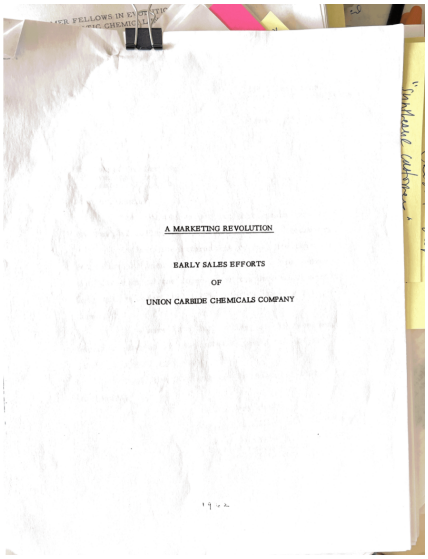
THE HISTORY OF VINYLS AND PLASTICIZERS
AT UNION CARBIDE CORPORATION

Maxwell Sutherland
January 1996

UNION CARBIDE HISTORY
ARCHIVE INDEX NO. VP

The “embarrassing surplus” of ethylene dichloride is discussed in the above document, but the direct quote comes from: Union Carbide Golden Jubilee. Fifty Years of Progress, 1920-1970, *Carbide News*, S. Charleston Plant, WV. September 10, 1970 Vol (13): 36, p. 6.

On lackluster early Vinylite sales, marketing struggles and the existence of a credit department, see A Marketing Revolution: Early Sales Efforts of Union Carbide Chemicals Company. C. W. McConnell to R. D. Stief, October 31, 1995.


A MARKETING REVOLUTION

EARLY SALES EFFORTS
OF
UNION CARBIDE CHEMICALS COMPANY

Other sources consulted on early Carbide history in ethylene-derivatives and vinyls:

J.G. Davidson. 1956. Petrochemical Survey: An Anecdotal Reminiscence. *Chemistry and Industry.* May 1956, p. 392-398.

Robert D. Stief. (1998). A History of Union Carbide Corporation, From the 1890s to the 1990s. Published by the Carbide Retiree Corp., Inc. Available via the Science History Institute, Philadelphia, PA.

Simon Meyer. 1979. Carbide: The Recollections of the Early Years. Courtesy of Kim Johnson.

Robert C. Hieronymus. 1997. Union Carbide Corporation History: Olefins, Early Period 1914 through 1950. September 1997.

J.N. Compton. 1945. The Beginning of the Chemicals Corporation and the Clendenin Development. Courtesy of Kim Johnson. Carbide and Carbon Chemicals Corporation. 1939.

The Carbide and Carbon Chemicals Corporation's Early Growth. Carbide News. June 1939. 3-13.

Carbide and Carbon Chemicals Corporation. 1940. Corporation Passes Twenty Year Mark. Carbide News. November 1940. 3-6.

The History of UCC. A 35-minute film made by Union Carbide via Westridge Production Center, Danbury, CT. Courtesy of Kim Johnson.

For a more narrative history, see also Rebecca Altman. 2021. Upriver, published in *Orion Magazine*, Summer 2021. (Full bibliography here.) https://orionmagazine.org/article/upriver/

On the carcinogenicity of styrene, vinyl chloride, butadiene – all monomers used in commodity plastics production—

After forty years of research, a working group of 23 scientists (from 12 countries) International Agency on Research and Cancer (IARC), based on the weight of the evidence, in March 2018, upgraded the status of styrene from "possibly" to "probably carcinogenic," a determination which, to the casual reader, can be confusing. Note: The designation of "possibly" or "probably" carcinogenic has strict meaning, and is a characterization of the strength of the scientific evidence NOT of the cancer-causing potential of the chemical itself.

A breakdown of the IARC carcinogen classification system is available here: https://ec.europa.eu/health/scientific_committees/opinions_layman/en/electromagneticfields/glossary/ghi/iarc-classification.htm

IARC grouped styrene as a Group 2A "probably carcinogenic" based on the weight of the scientific evidence, meaning there is evidence to support that it is carcinogenic. The National Toxicology Program, in their review of the evidence, determined styrene was "a reasonably anticipated human carcinogen." IARC. 2019. Styrene, Styrene-7,8-oxide, and Quinoline. IARC Monographs on the Evaluation of Carcinogenic Risks to Humans. Volume 121. Available at: https://www.ncbi.nlm.nih.gov/books/NBK551039/

See also: National Research Council 2014. *Review of the Styrene Assessment in the National Toxicology Program 12th Report on Carcinogens*. Washington, DC: The National Academies Press. https://doi.org/10.17226/18725

Mette Skovgaard Christensen, Jesper Medom Vestergaard, Francesco d'Amore, Jette Sønderskov Gørløv, Gunnar Toft, Cecilia Høst Ramlau-Hansen, Zara Ann Stokholm, Inge Brosbøl Iversen,

Mette Schou Nissen, Henrik Albert Kolstad. Styrene Exposure and Risk of Lymphohematopoietic Malignancies in 73,036 Reinforced Plastics Workers. *Epidemiology*, 2018; 29 (3): 342

For vinyl chloride, IARC classifies vinyl chloride as a group 1 human carcinogen – which officially means conclusive evidence of carcinogenicity. Available at: https://monographs.iarc.who.int/wp-content/uploads/2018/06/mono100F-31.pdf

Grosse Y, Baan R, Straif K et al. WHO International Agency for Research on Cancer Monograph Working Group (2007). Carcinogenicity of 1,3-butadiene, ethylene oxide, vinyl chloride, vinyl fluoride, and vinyl bromide. Lancet Oncol, 8: 679–680. doi:10.1016/S1470- 2045(07)70235-8 PMID:17726789

On 1,3- butadiene, is classified by IARC as a group I human carcinogen, meaning there is conclusive evidence underpinning that designation. See: https://monographs.iarc.who.int/wp-content/uploads/2018/06/mono100F-26.pdf

For general history of industrial petrochemistry, petrochemical and integrated or networked production:

Diane M. Sicotte. 2020. From cheap ethane to a plastic planet: Regulating an industrial global production network. Energy Research & Social Science. 66, 101479, https://doi.org/10.1016/j.erss.2020.101479

Ken Geiser. 2001. *Materials Matter: Towards a Sustainable Materials Policy.* MIT Press.

Joel Tickner, Ken Geiser and Stephanie Baima. 2021. Transitioning the Chemical Industry: The Case for Addressing the Climate, Toxics and Plastics Crises. *Environment: Science and Policy for Sustainable Development.* 63 (6): https://doi.org/10.1080/00139157.2021.1979857

Kathryn Steen. 2014. *The American Synthetic Organic Chemicals Industry, War and Politics, 191001930.* UNC Press.

Peter Spitz. 1988. *Petrochemicals: The Rise of an Industry.* John Wiley and Sons.

Center for International Environmental Law. 2017. Fueling Plastics, 4 part series, including:

Fossils, Plastics, and Petrochemical Feedstocks

How Fracked Gas, Cheap Oil, and Unburnable Coal are Driving the Plastics Boom

Fredric Bauer and Germain Fontenit. 2021. Plastic Dinosaurs-- Digging Deep in the Accelerating Lock-In of Plastics. *Energy Policy* 156 (2021): 112418.

R. Banerjee, Y. Cong, D. Gielen, G. Jannuzzi, F. Maréchal, A. McKane, M. Rosen, D. van Es and E. Worrell , "Chapter 8 – Energy End Use: Industry," in Global Energy Assessment – Toward a Sustainable Future, Cambridge, New York and Laxenburg, Cambridge University Press, 2012, pp. 513-574.

Frederic Bauer and Tobias Dan Nielsen. 2021. Oil Companies are Ploughing Money into Fossil-Fuelled Plastics Production at a Record Rate—New Research. *The Conversation*. November 2, 2021. https://theconversation.com/oil-companies-are-ploughing-money-into-fossil-fuelled-plastics-production-at-a-record-rate-new-research-169690

Re: reticent early markets for Celluloid, Bakelite and general 19th-early 20th cntury plastics history:

Robert Friedel. 1983. Pioneer Plastic: The Making and Selling of Celluloid. Madison, WI: University of Wisconsin Press

Jeffrey Meikle. 1995. American Plastic: A Cultural History. New Brunswick, NJ: Rutgers University Press.

On history of polystyrene development and uncertainties about its commercial prospects in the US:

James J. Bohning. 1990. Subterfuge and Patriotism: Styrene at Dow for the World War II Synthetic Rubber Program. Presented at the AICh Annual Meeting, 12 November 1990. And available via the Sylvia Stroesser papers collected at the University of Iowa.

See also: A. L. Ward and W. J. Roberts. 1951. *Styrene*. Interscience Publishers, Inc.

Although styrene and some of its polymers have been known for well over a century, it was not until the advent of the second World War that styrene became an item of widespread commercial use. The first recognition of its commercial possibilities is said to have been in Mathew's British patent 16,278 dated 1911, It was first produced commercially in Germany in 1930. In the United States, during the nineteen twenties, Ostromislensky (127) did a large amount of work in an effort to introduce and produce styrene. The first commercial production in this country in 1933 failed because of the inferior quality and high price of the polystyrene.

Styrene production was resumed in the United States by different interests in 1937. At the start of the second World War, the production was very small, but was growing steadily. Its commercial use was exclusively for the production of polystyrene for injection molding powders. Although certain problems such as blushing of the polymer had not been solved and polystyrene distorted at only moderately high temperatures, the product was generally

On pre- and post-war polystyrene production statistics, see:

C.A. Breskin. 1947. Taking The Stress out of Styrene. *Scientific American*, *176*(1), 11–14. http://www.jstor.org/stable/24960622

On ICI polyethylene/polythene license to DuPont and Union Carbide via US Navy, and on technological, legal and commercial difficulties during, and following WWII:

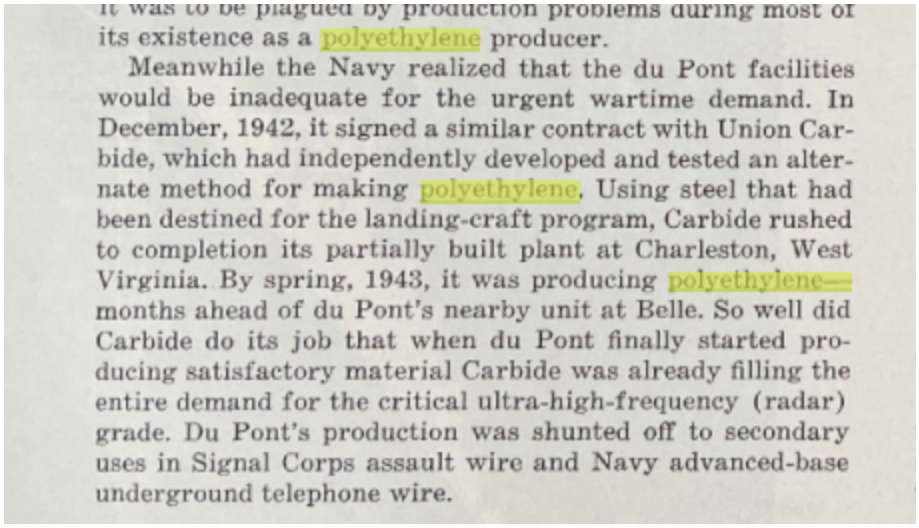
Jeff Meikle. 1997. *American Plastics*. Rutgers University Press.

David Hounshell and John Kenly Smith. 1988. *Science and Corporate Strategy: DuPont R&D, 1902-1980*. Cambridge University Press.

The Polyethylene Gamble. Fortune. February 1954.(136). Here, p. 136, makes mention of the DuPont and Carbide plants built to make PE for the Navy:

between the two companies. Something special, like the agreements covering nylon, might be more suitable.

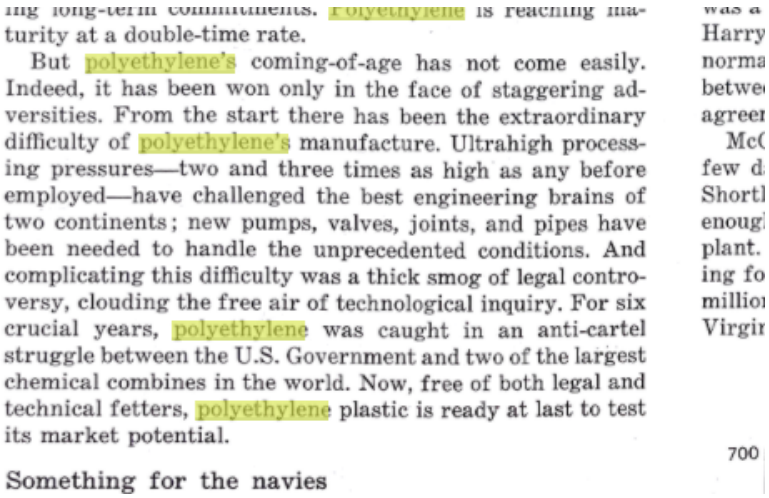
McGowan's letter struck a responsive chord. Within a few days three du Pont engineers were flying to London. Shortly before Pearl Harbor they were back in the U.S. with enough operating information to design an American-built plant. In March, 1942, du Pont signed a Navy contract calling for the construction, by the Bureau of Ships, of a two-million-pound plant at the du Pont works in Belle, West Virginia. The unit was completed by the middle of 1943, but



it was to be plagued by production problems during most of its existence as a polyethylene producer.

Meanwhile the Navy realized that the du Pont facilities would be inadequate for the urgent wartime demand. In December, 1942, it signed a similar contract with Union Carbide, which had independently developed and tested an alternate method for making polyethylene. Using steel that had been destined for the landing-craft program, Carbide rushed to completion its partially built plant at Charleston, West Virginia. By spring, 1943, it was producing polyethylene—months ahead of du Pont's nearby unit at Belle. So well did Carbide do its job that when du Pont finally started producing satisfactory material Carbide was already filling the entire demand for the critical ultra-high-frequency (radar) grade. Du Pont's production was shunted off to secondary uses in Signal Corps assault wire and Navy advanced-base underground telephone wire.

And re: difficulties, p.135:



ing long-term commitments. Polyethylene is reaching maturity at a double-time rate.

But polyethylene's coming-of-age has not come easily. Indeed, it has been won only in the face of staggering adversities. From the start there has been the extraordinary difficulty of polyethylene's manufacture. Ultrahigh processing pressures—two and three times as high as any before employed—have challenged the best engineering brains of two continents; new pumps, valves, joints, and pipes have been needed to handle the unprecedented conditions. And complicating this difficulty was a thick smog of legal controversy, clouding the free air of technological inquiry. For six crucial years, polyethylene was caught in an anti-cartel struggle between the U.S. Government and two of the largest chemical combines in the world. Now, free of both legal and technical fetters, polyethylene plastic is ready at last to test its market potential.

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Something for the navies

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On Teflon/PTFE production spurred by Manhattan Project:

Rebecca Altman 2019. Time Bombing the Future. Aeon Magazine.

Malcolm M. Renfrew, interview by James J. Bohning at New Orleans, LA, 31 August 1987. (Philadelphia: Chemical Heritage Foundation/Now: Science History Institute.) Oral history transcript #0076. -- *Renfrew was a DuPont employee charged with scaling the industrial process for making PTFE. His oral history is a key source on how PTFE/TEFLON was produced pre-war*

in gram measure, and the role of the Manhattan Project in spurring on development. Here is page 24 from that oral history:

It turned out, of course, that they were counting on PTFE to be the gasket material for the gaseous diffusion process, that was to be used at Oak Ridge in the gaseous separation of uranium isotopes. But it didn't turn out to be a really satisfactory gasket material; it would flow under pressure. Also, there were enough impurities in the polymer the way we were making it then that there were reactions with uranium hexafluoride. There were a number of things that mitigated against Dunning's proposed use, but a lot of PTFE went into the war effort. A lot of it was used later at Hanford in the plutonium process and that's where Willard Crane soon went. He was transferred there by Du Pont and was there during the rest of the war years. I then moved into his position. I was head of an engineering group that was doing the scale-up of polymerization. I had taken a night-school course in Badger and McCabe (15), and thus became an engineer! It may have been a source of embarrassment to my chemical engineering friends that I got into the American Institute of Chemical Engineers as a "senior member". They had such a classification then and I made that on the strength of my short course and my associates.

BOHNING: You said that Dunning wanted to be making a million pounds a month. You then were making the polymer in hundred gram lots?

RENFREW: Fifty or a hundred grams. We had a small rocker tube and we did early manufacture in that equipment.

BOHNING: Were you principally looking at catalysts, trying to find better catalysts?

RENFREW: Well, this was one of the needs. Actually, I can't

Key:
PTFE = Teflon (branded)
Dunning w/ Manhattan Project (at Columbia)
Renfrew, worked for DuPont.

A.V. Grosse and G.H Cady. 1947. *Industrial Engineering Chemistry* p. 368. – how the Manhattan Project analyzed and determined Simons' fluorocarbons could withstand uranium hexafluoride.

Park J. D., Benning A. F., Downing F. B., Laucius J. F. and McHarness R. C. (1947) Synthesis of tetrafluoroethylene. *Ind. Eng. Chem*.39, 354–358.

Interview with Irénée du Pont, Jr. by the Voices of the Manhattan Project. Atomic Heritage Foundation. Dated: August 11, 2014. Available here: http://www.manhattanprojectvoices.org/oral-histories/irénée-du-pont-jrs-interview-2014

Interview w/ Raymond P. Genereaux. Hanford, "we made the first real use of Teflon" Design: The Met Lab and DuPont. In *Working on The Bomb: An Oral History of the WWII Hanford*. S.L. Sanger. Continuing Education Press: Portland State University.

Bill Wilcox. 2007. In Memoriam: Joe Dykstra (re: fluorine production at Hooker and K-25 fluorocarbons at Oak Ridge). Published 3 May 2007. The Atomic Heritage. www.atomicheritage.org Also, interview with Joe Dykstra via www.manhattanprojectvoices.org.

Carleton A. Sperati. 1986. Polytetrafluoroethylene: History of Its Development and Some Recent Advances. In: *High-Performance Polymers: Their Origins and Development.* Ed. R.B. Seymour and G.S. Kirschenbaum. P.267-278.

Volume I of Book VII of the Manhattan District History. Feed Materials and Special Procurement. Appendix G: Special Chemicals for K-25.

David Hounshell and John Kenly Smith. 1988. *Science and Corporate Strategy: DuPont R&D, 1902-1980*. Cambridge University Press

On general history of WWII and plastics

U.S. Tariff Commission. 1948. Plastics Productions. War Changes in Industry Series, Report No. 28, Government Printing Office, Washington, DC.

British Intelligence Objectives Sub-Committee Surveys Report No. 34. 1954. The German Plastics Industry during the Period 1939-1945. Her Majesty's Stationery Office, London.

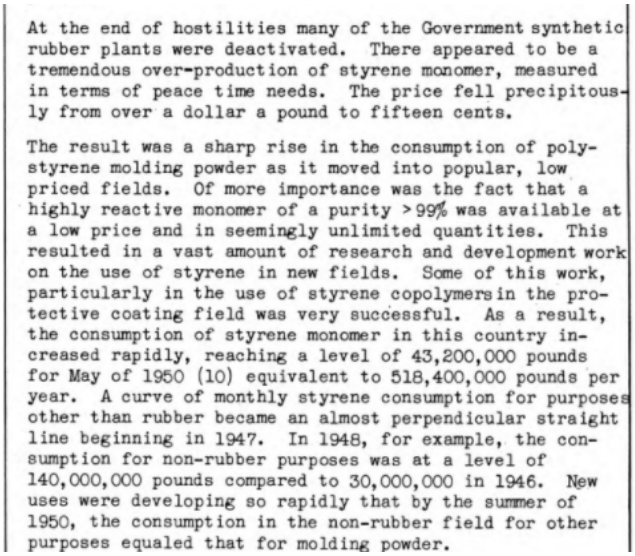
John M DeBell, William C. Goggin and Walter E. Gloor. 1946. *German Plastics Practice: A Record, Rewritten and Amplified.* Report initially commissioned by the Quartermaster Corps. Reprinted with permission by the Department of Commerce. Murray Printing Company, Cambridge, MA.

Jeffrey Meikle. 1995. *American Plastic: A Cultural History*. New Brunswick, NJ: Rutgers University Press.

Joel Tickner, Ken Geiser and Stephanie Baima. 2021. Transitioning the Chemical Industry: The Case for Addressing the Climate, Toxics and Plastics Crises. *Environment: Science and Policy for Sustainable Development.* 63 (6): https://doi.org/10.1080/00139157.2021.1979857

Re: the Post-War production boom of polystyrene because of excess styrene capacity (from synthetic rubber production), see:

A. L. Ward and W. J. Roberts. 1951. *Styrene*. Interscience Publishers, Inc. Here, p. 2



At the end of hostilities many of the Government synthetic rubber plants were deactivated. There appeared to be a tremendous over-production of styrene monomer, measured in terms of peace time needs. The price fell precipitously from over a dollar a pound to fifteen cents.

The result was a sharp rise in the consumption of polystyrene molding powder as it moved into popular, low priced fields. Of more importance was the fact that a highly reactive monomer of a purity >99% was available at a low price and in seemingly unlimited quantities. This resulted in a vast amount of research and development work on the use of styrene in new fields. Some of this work, particularly in the use of styrene copolymers in the protective coating field was very successful. As a result, the consumption of styrene monomer in this country increased rapidly, reaching a level of 43,200,000 pounds for May of 1950 (10) equivalent to 518,400,000 pounds per year. A curve of monthly styrene consumption for purposes other than rubber became an almost perpendicular straight line beginning in 1947. In 1948, for example, the consumption for non-rubber purposes was at a level of 140,000,000 pounds compared to 30,000,000 in 1946. New uses were developing so rapidly that by the summer of 1950, the consumption in the non-rubber field for other purposes equaled that for molding powder.

On polystyrene's comparatively smaller role in packaging today, compared with polyethylene and polypropylene: *(For 2% statistic, see page 20).*

United Nations Environment Programme (2021). Drowning in Plastics – Marine Litter and Plastic Waste Vital Graphics. Available at: https://wedocs.unep.org/xmlui/bitstream/handle/20.500.11822/36964/VITGRAPH.pdf

On the history of synthetic rubber, including production of styrene and butadiene:

Carbide and Carbon Chemicals Corporation. 1943. Butadiene and Styrene for Buna S Synthetic Rubber from Grain Alcohol. Carbide and Carbon Chemicals Corporation, New York.

Dow. c 1944. *Styrene: A Chemical Charged with Tremendous Public Promise.* Advertisement. Available from the Science History Institute, Philadelphia, PA.

U.S. Tariff Commission. 1945. Rubber. War Changes in Industry Series, Report No. 6, Government Printing Office, Washington, DC.

Mark R. Finlay. 2013. *Growing American Rubber: Strategic Plants and the Politics of National Security.* Rutgers University Press.

Frank A. Howard and Robert A. Millikan. 1947. *Buna Rubber: The Birth of an Industry.* D. Van Nostrand Company, Inc.

The Rubber Industry in Germany during the period 1939-1945, British Intelligence Objectives Sub-Committee Overall Report No. 7. 1948. London: His Majesty's Stationery Office.

Peter J. T. Morris. 1989. *The American Synthetic Rubber Research Program*. University of Pennsylvania Press.

Jeffrey Meikle. 1995. *American Plastic: A Cultural History.* New Brunswick, NJ: Rutgers University Press.

On plastics, petrochemical industry as a major advertising client, see:

Where Ads Must Blaze the Market. 1963. Reprinted in *The Chemical Industry: Viewpoints and Perspectives,* Conrad Berenson, editor. John Wiley and Sons, Inc.

Jeffrey Meikle. 1995. American Plastic: A Cultural History. New Brunswick, NJ: Rutgers University Press.

On plastics and disposability:

Max Liboiron**.** 2013. Modern Waste as Strategy*," Lo Squaderno: Explorations in Space and Society*, 29: 9-12: https://maxliboiron.files.wordpress.com/2013/08/liboiron-modern-waste-as-strategy-extracted1.pdf

Lloyd Stouffer. 1963. "Plastics Packaging: Today and Tomorrow. Report presented to The Society of the Plastics Industry, Inc, at the SPI Annual National Plastics Conference, Sheraton-Chicago Hotel, Chicago, Illinois, November 19-21, 1963. Made available courtesy of Max Liboiron via Discard Studies: https://discardstudies.files.wordpress.com/2014/07/stoffer-plastics-packacing-today-and-tomorrow-1963.pdf (Last accessed 30 October 2021).

Sydney Gross. 1969. Garbage. *Modern Plastics*. April 1969. Also. Garbage (2). *Modern Plastics* January 1970. Garbage (4). *Modern Plastics*, August 1971.

Susan Strasser. 1999. *Waste and Want: A Social History of Trash.* (Henry Holt).

Gay Hawkins. 2013. Made to be Wasted: PET and Topologies of Disposability. In: *Accumulation: The Material Politics of Plastic*, 63–81. Oxford: Routledge. DOI: https://doi.org/10.4324/9780203070215-12

On polystyrene as an important 20th century "packaging plastic:"

BP Educational Service 1976. The Polystyrene Story. BP. Available via https://archive.org/details/polystyrenestory0000bped

On plastics push into packaging market: see Jeff Meikle. 1997. *American Plastic.* And: Susan Freinkel. 2011. Plastics: A Toxic Love Story. Houghton Mifflin Harcourt, especially pages. 142-6. And specifically on critique, "economic imperialism," see Barry Commoner. 1977. The Promises and Perils of Petrochemicals. *New York Times.* September 25, 1977. https://www.nytimes.com/1977/09/25/archives/the-promise-and-perils-of-petrochemicals-the-petrochemical-industry.html

On polystyrene in Napalm:

Napalm-B to Use Huge Amount of Polystyrene. Chemical and Engineering News. 1966 44(11): 24. See also Robert Neer. 2015. *Napalm: An American Biography*. Harvard University Press.

On disposable plastics and plastic packaging beyond public demand or awareness, see:

Jeffrey Meikle. 1995. *American Plastic: A Cultural History.* New Brunswick, NJ: Rutgers University Press.

Barry Commer. 1977. The Promise and Perils of Petrochemicals. *The New York Times.* 25 September 1977.

Finn Arne Jørrgenson. *Recycling*. 2019. MIT Press.

Catherine Liamzon et al., 2020. Sachet Economy: Big Problems in Small Packets. Global Alternatives for Incineration Alliance. Available at: https://www.no-burn.org/wp-content/uploads/Sachet-Economy-spread-.pdf

For further instructions on how to soak a paper takeaway cup to reveal inner plastic lining, consult the website of the University of Toronto Trash Team: https://uofttrashteam.ca/ Instructions here: https://uofttrashteam.ca/wp-content/uploads/2021/05/PlasticCycle-Activity1.pdf

On how little plastic has been effectively recycled and why recycling is so complex:

Geyer R, Jambeck JR, Law KL. 2017. Production, use, and fate of all plastics ever made. Sci Adv. 2017 Jul 19; 3(7):e1700782. *Note: this is the source for statistic on less than 10% of*

plastics made since 1950 have been recycled. And for statistic "more plastics had been made in the last two decades than in the 20th century."

Samantha Macbride. 2011. *Recycling Reconsidered*. MIT Press.

Diane M. Sicotte & Jessica L. Seamon. 2021. Solving the Plastics Problem: Moving the U.S. from Recycling to Reduction, *Society & Natural Resources*, 34:3, 393-402, DOI: 10.1080/08941920.2020.1801922

John N. Hahladakis et al. 2018. An overview of chemical additives present in plastics: Migration, release, fate and environmental impact during their use, disposal and recycling. *Journal of Hazardous Materials.* 344: 179-199. https://www.sciencedirect.com/science/article/pii/S030438941730763X

Tridibesh Dey. 2021. Plastic Mut(e)ability: Limited Promises of Plasticity. Worldwide Waste: *Journal of Interdisciplinary Studies,* 4(1), p.7. DOI: http://doi.org/10.5334/wwwj.63

Sharon Lerner. 2019. Waste Only: How the Plastics Industry is Fighting to Keep Polluting the World. *The Intercept*. July 20, 2019. Available at: https://theintercept.com/2019/07/20/plastics-industry-plastic-recycling/

Laura Sullivan.2020. How Big Oil Misplead the Public into Believing Plastic Would be Recycled. *NPR.* September 11, 2020. Available at: https://www.npr.org/2020/09/11/897692090/how-big-oil-misled-the-public-into-believing-plastic-would-be-recycled

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Aggressive industry lobbying: For instance, the industry's tough tactics succeeded in preventing Suffolk County, New York, from implementing the nation's first ban on plastic packaging, including plastic bags. After the law was passed in 1988, manufacturers sued, tying it up in litigation for four years. The county won in court, but by then recycling programs had been put in place, the public had lost interest, and the county decided to drop the ban. John McQuiston, "Suffolk Legislators Drop a Ban on Plastic Packaging for Foods," *New York Times,* March 9, 1994.

major public relations effort: Information about the fashion shows and other programs can be found at http://www.plasticsmakeitpossible.com. Meanwhile the SPI has pledged to launch a major ten-million-dollar Internet campaign, Imagine the Possibilities with Plastic, that will tout the materials' benefits while also rebutting what the industry considers the huge amount of misinformation about plastics on the Web. Mike Verespej, "Playing Offense," *Plastics News,* June 29, 2009.

the group spent $5.7 million: Lobbying disclosure reports filed with the California secretary of state's office. The 2007–2008 session was also the period during which California's Green Chemistry Initiative was being debated, a measure in which the ACC had a far greater stake. As of the third quarter of 2010, the group reported it had spent nearly $1.2 million on the 2009–2010 legislative session, though not all on bag-related efforts. The same session, the ACC was fighting a proposed ban on bisphenol A. At the federal level, the ACC spent $4.9 million on lobbying in 2008 and more than $8 million in 2009, according to www.opensecrets.org.

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during the 1980s and 1990s to employ the third strategy. Many of the laws and regulations drafted during the late eighties attempted to address the issue of solid waste. Frequently, they were based on common perception, rather than fact. FPA was instrumental in challenging and changing these laws and regulations.

One such case involved a regulation passed in Suffolk County on New York's Long Island. The regulation, which was passed on March 29, 1988, prohibited non-degradable plastic food packaging at the retail point of purchase. It also prohibited most Polyvinyl Chloride (PVC) and all polystyrene packaging. In August 1988, FPA joined The Society of the Plastics Industry, Inc., the Polystyrene

Clockwise from top: Max Katz and family at 1983 Annual Meeting, Jeff Siebenaller, R.J. Williams, John Woolford and Jerry Mitchell, Ralph March, Ernie Preston, 1980s Annual Meeting attendees, Sam Zutler and Harold Shehan.

conditions. Currently, composting is not used in any significant way as a means of handling municipal solid waste."

The court agreed and the ban on plastics in Suffolk County was lifted. In its decision, the court held "not only that the negative declaration by an improper agency, which in any event, failed to consider all the relevant and available evidence, was incorrect, but it was also so much in conflict with the conclusion patently suggested by the aggregate of the evidence in the record that the issuance of such negative declaration constituted action which must be characterized as arbitrary and capricious."

The victory in Suffolk County did much more than lift the ban in this small region. It also caused other jurisdictions to more carefully consider this type of statute before they worked to enact them. FPA scored similar victories all over the country.

John Woolford, interim President of FPA, remembers these victories. "FPA was on the front edge of the solid waste and clean air issues. When everyone was screaming for blood from packaging companies, FPA was there."

Images

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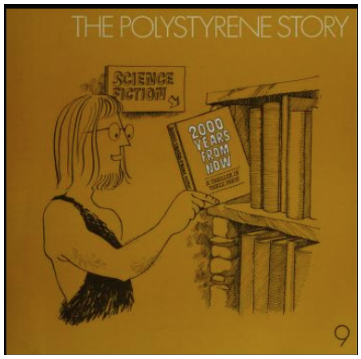

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