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THE PROBLEMS AND TRENDS OF THE CHEMICAL INDUSTRY

by

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I am always a little diffident about appearing before any group of students, and more particularly such a mature group as I find here. I always think of an argument in our family when my oldest daughter, a girl in the grades, in order to close it, said: "Well, Daddy, I ought to know better than you do - I am going to school and you are not." Perhaps what I shall say here in some respects comes under the same heading.

In discussing the chemical industry, I think we might begin by trying to define it. There are many definitions of it. Perhaps you gentlemen who study statistics know that the census gives us one classification of the chemical industry.

We like to think of the chemical industry as one in which a real change in composition takes place during the process of manufacture, in contrast to mechanical industries such as machine tools, for example, where the real changes are physical in form and not changes in composition. Some would go even further and say that any industry in which a process is being utilized, where a change in chemical composition takes place, should at least be called a chemical process industry if not indeed a chemical industry. Perhaps a correct definition would be that a chemical industry is either one which is engaged in the manufacture of such heavy chemicals as acids, alkalies, and things of that sort; or fine chemicals of one type or another -- those of extreme purity manufactured in lesser quantity and very much higher quality than the average heavy chemicals, though even there we find some things of extraordinarily high purity; and then perhaps the pharmaceutical industry which is a highly developed branch of the chemical industry. In the latter industry some of the most worthwhile work is now being done, particularly in those border lands between chemistry and other sciences, particularly biology.

When it comes to a question of the products of the chemical industry, I think you realize that in some respects this industry is less appreciated than others in that the ultimate consumer in most instances does not recognize its products; to a considerable extent they are the raw materials of the next industry in the line of manufacture. You very seldom, for example, go out and buy sulphuric acid. You are not likely to buy many of the other acids or chemicals produced in large quantities. You do not buy dyestuffs as such. Therefore, you are probably not conscious of the extent to which the industry serves. There is an inscription on the laboratory at Cornell University which, among other things, says this as to chemistry: "A Science Ministrant to Sciences." I think the same may be said about the chemical industry. To a very large extent it is an industry which serves other industries. That is a disadvantage in this respect: The difference between the cost of a dyestuff which is quite unsatisfactory to you in your suit of clothes, one that is not fast to light or washing, does not clean well in dry cleaning, etc., and a similar amount of the dyestuff that will withstand those things is, on the average, about 30¢ or 35¢ in a suit of clothes. But the man who manufactures the textile, the man who manufactures the clothing, when he multiplies the units he expects to sell throughout the year by this 30¢ or 35¢ is concerned with a sum which leads him too often to choose the less satisfactory dyestuff and then blame our industry for not being able to produce in America the good old dyestuffs they used to get on the other side of the water. Curious to say, this suit of clothes I have on this morning resulted from a question I raised with a manufacturer as to why he continued to use German dyestuffs instead of American dyestuffs. Instead of answering my question he sent me this length of cloth with his compliments. I liked the cloth, returned a check at once for it, repeating my query; and we are still arguing over the merits of imported and American-made dyestuffs. That, of course, is a long story into which you undoubtedly have gone in your study of textiles.

Another unique thing about the chemical industry is that it is its own best customer in that some of the largest tonnage of things produced by the industry are used by that same industry. For example, the Dow Chemical Company manufactures a large amount of synthetic phenol and they use that phenol in the production of other products. That example may be multiplied a good many times.

The chemical industry, however you regard it from the standpoint of definition, extends very far in its ramifications and you find chemical products turning up in all sorts of places. Perhaps that is one reason why the industry as a whole survives the ordinary depression very much better than any other industry. I have not brought along a lot of curves this morning but I think if you will take the present recession and examine the stock market prices say in July and what has happened since, you will find that the stocks of the chemical companies have held up better than most of the others. If I were an artist or a cartoonist I would like to draw you a sketch this morning showing a number of fairies or gnomes or magicians or something of that sort, which I should label "Research", "Development", "Production", "Management", and "Distribution", pushing up that curve of chemical stocks. It does stay above the curve of those industries where science is not used to a similar extent.

Most people, I think, will agree that the chemical industry in the United States goes back to about 1835 to 1840, when some very crude beginnings were made along the Atlantic seaboard, principally in New England. There were in Virginia also some industries which we like to call chemical industries.

By the time of the World War the United States was pretty well leading the world in the inorganic chemical field with respect to tonnage, value and variety, but we did not have anything to speak of in the way of a synthetic organic chemical industry. I have often said that if the United States got anything out of the World War it was a synthetic organic chemical industry. In 1917 I wrote a little piece which was published in the Journal of Industrial and Engineering Chemistry called "The German Alarm Clock" and the theme of my story was that how ever the war came out, Germany would suffer through awakening the rest of the world to the utility of applied science in industry thereafter loosing export trade. I am not a prophet but you know what has happened as a result of calling the attention of the world to the potentialities of science. In the group of synthetic organics I suppose the ones of greatest interest to us are the medicinals and pharmaceuticals; secondly, the dyestuffs upon which we depend for so many things. For my part I think I could get along without dyestuffs but I am told by the psychologists that I would soon find myself feeling differently if all color for manufactured goods were cut off. In any event those were products upon which Germany had a monopoly at the time and they tried to use the power that gave them to force a change in the position of the United States. Cut off the dyestuffs, the pharmaceuticals, and medicinals, and the cries from labor and the pleas from the people in the hospitals would be enough to break the neutrality of this country. As you know, that did not work and it never can work because we are now not only independent but I think it could be shown that we are in a position of leadership in synthetic organic chemistry. To the two great groups of products noted above we must add the synthetic perfumes, photographic chemicals, flavoring extracts, and the long list of things that come out of that rather smelly, unpromising mess that we know as coal tar.

Part of the growth of the chemical industry since the World War is unquestionably due to the action taken by the Government in consenting to the setting up of the Chemical Foundation, Inc. You will recall that that was a device to take over the patents that were held by the Germans in this country at that time. There has been a great deal of controversy about the whole thing. As a matter of fact, it has been through three courts (finally settled by the Supreme Court of the United States), each court ruling in favor of the Chemical Foundation when the Government, during the Harding administration, brought suit to dissolve that corporation. The fundamental reason for taking over those patents was that for the most part they were product patents and no matter how clever you might be in devising other ways of reaching the objective there was a patent on that product after you made it, and the control of that patent by an enemy was being used against the United States quite as much as any other resource of value in conducting a war. There seems to have been ample justification for purchasing those patents and licensing them freely to those American citizens who might care to use them. That, together with some very material help in the way of tariffs in the beginning, has built up this great industry which makes us quite independent in respect to a number of things that have strategic importance and certainly are always worthwhile from the standpoint of the general public.

The size of the industry may be of some interest to you. Going back to the census, if we take Group 6, the United States Census of Manufacturers, which is chemical and allied plants, we find them in every state of the Union, with the greatest concentration in the highly populated areas of New Jersey, New York, Illinois and some in Missouri. Chemicals and allied products in the last census were estimated to be worth $2,837,000,000.00 for the year. In Group 608, which is that miscellaneous group of chemicals not elsewhere classified, we find 570 establishments in the country with salaried officers and employees of 14,541; wage earners, average for the year, 65,838; salaries amounting to something over $37,000,000.00; wages, $80,500,000.00; materials, including the purchase of power, containers and that sort of thing, in excess of $329,000,000.00; value added by manufacture nearly $340,000,000.00; and a total value of production, $668,697,448.

Another measure of size is perhaps the total tangible assets of some of the companies, and I have put down just a few here to give you an idea. The size of du Ponts, for example, exceeds $536,000,000.00; Union Carbide and Carbon, $247,036,000.00; Allied Chemical and Dye Corporation nearly $191,000,000.00; Aluminum Company of America, $166,901,000; Eastman Kodak Company, $142,208,000.00. Perhaps you will not class some of these companies, as I do, in the chemical field. I will be glad to tell you why I do it if you are interested. Proctor and Gamble, $115,835,000.00; National Lead Company, $79,735,000.00; Pittsburgh Plate Glass, $94,701,000.00; American Cyanamid, $41,611,000.00; Park Davis over $36,000,000.00; Texas Gulf Sulphur, $57,730,000.00; Sherman Williams Company, $44,294,000.00; Dow in excess of $25,000,000.00; and from there on down. I have only taken a few of them to indicate in a general way something of the size and distribution of the industry.

I think that while many of the concerns are on the Atlantic seaboard, from the standpoint of production for the country in the case of emergency, they are fairly well scattered and you will find some of nearly all of the really essential manufactured products in other parts of the country that are very well protected, as for example the Charleston, West Virginia area. That valley in the last several years has become an extraordinarily active place chemically, and Charleston has become one of the most prosperous towns in the whole United States. Westvaco Chlorine Products Corporation have a capacity of 500,000 pounds of chlorine every 24 hours. I submit that is quite a lot of chlorine and most of it is being used locally, for example, by Carbide and Carbon Chemicals Corporation in the manufacture of various solvents. There we have industries built up on the natural resources of that location. Carbide and Carbon is built up on the products of petroleum, some of the olefines, unsaturated hydro-carbons. Operating on the salt supply of that area with the natural gas available makes it attractive for other industries. Du Pont's great plant for fixation of atmospheric nitrogen manufacture of solvents, fertilized chemicals, etc., is in the vicinity, the Bell Alkali Works, and the glass factories. One industry begets another and we have a great area developing in that particular location.

There is one thing peculiar about the industry often overlooked in consideration by those who are studying the labor situation and that is the very large capital investment per worker, which I think can be shown to exceed that of any other industry in the country. Some of the recent figures I have seen indicate that in at least some companies there is a capital investment approaching $10,000.00 for every man who is employed in the plant. When studies are made of the share labor is paid, in some of these companies you will reach the wrong conclusion unless you take into consideration the very large capital expenditure necessary for this type of industry. It is also worth noting that according to the National Industrial Conference Board whereas in industry as a whole throughout the country about 13% are of the salaried technical class, in the chemical industry this runs above 28%, so you are getting into a different sort of personnel and consequently a much lower turnover in labor than is true in many other industries. Those of you who study statistics will also find that the recovery made by the chemical industry was much more rapid from the standpoint of employment than many other of the industries, and long before most of them the chemical industry had raised its employment above that of 1929 with satisfactory hours and a higher return per worker, including common labor. I have not brought along those figures because they are easily accessible to you. From the standpoint of employment, wages paid, capital invested, and hours of work, we are rather proud of the record of the chemical industry.

In addition, we ought to consider the raw materials, which of course come from everywhere and are of every type. We hear so much about the relation of industry to agriculture I thought it might interest you to give a few figures showing the purchase and use by one chemical company of farm products. The example I have chosen is du Ponts; for they use annually 47,000 tons of wood pulp, 85,000 bales of cotton linters, 30,000 bales of cotton staple, 40,000,000 gallons of molasses, 1,300,000 bushels of corn, 42,000,000 pounds of vegetable oils, and 500,000,000 pounds of turpentine. If anyone has the impression that agriculture does not benefit from the utilization of its products by the chemical industry they are somewhat mistaken. I believe there are now estimated to be 26,000,000 acres of our land producing products that go into non-food uses, largely through the chemical industry.

For another way of viewing the size of these plants, I may say that 82% of all chemical wage earners are in plants that employ 1,000 or fewer employees; 56% are in plants employing 500 or less; 38% in plants employing 250 or less. Now at the other end of the scale is a company like du Ponts who currently employ between 53,000 and 55,000 employees. I sometimes think that if the people who are critical of "big industry" had to meet a payroll of that sort every week they might have a very different idea of the responsibilities of industry and its true relation to the general economics of the country. Some of us have to worry about meeting the butcher or grocer each week, let alone paying 53,000 to 55,000 people. That at least is another way of looking at what the industry is like.

Another unique feature about the chemical industry is the extent to which it conducts and relies upon scientific research. Recent estimates say that 4 3/10% of the total gross sales in the organic chemical industry are devoted to research; that is, out of every $100.00 of sales they spend $4.30 on research. In the inorganic industry that is $2.25 out of each $100.00 - not because the inorganic industry is less progressive but in the nature of things there is not quite the amount of research to be done at present in inorganic chemistry.

It is very difficult to realize how vast is this field of organic chemistry. Dean Whitmore of Pennsylvania State College says that we know a little something about 500,000 compounds of carbon, but the number that are possible will run into astronomical figures. The tremendous number of things that can be and are made involving the element carbon gives us some appreciation of the opportunity for research on a very large scale. I know of no other industry that makes so large an annual expenditure, which probably runs not less than $20,000,000.00 in its establishments, not counting the work which it supports through fellowships and other grants in our educational institutions.

Another thing of interest is the obsolescence that we find in chemical plants, not merely because they are so often dealing with corrosive materials that would of themselves cause obsolescence, but because new processes and new products are always sought. At one time, for example, when there was some difficulty with cellulose nitrate used in sheets in safety glass I knew of one plant where $20,000.00 were spent on one mixing apparatus. The stainless steel used was quite new, and it was hoped that by using it, higher purity and consequently better quality of material could be produced. There was no way of definitely knowing except by spending $20,000.00 on one mixer. There are numerous examples of that sort of thing where new equipment is devised that is so much better than the one that has been used that the old is scrapped in favor of the new.

The cooperative effort among the industry is also notable. The Manufacturing Chemists Association is one of the oldest associations in the country. It runs back more than seventy-five years, I believe. Through that association (it is by no means or in any sense a price-fixing organization) the industry has accomplished many things in safety, in developing better types of containers, in improving the transportation of hazardous materials, and all that general type of work. Then there is the Synthetic Organic Chemical Manufacturers Association of the United States. That is the kind of name evolved, I think, by a committee after an all night's session. As you know, there are pharmaceutical groups and the like in addition to these trade organizations and they do cooperate very closely with the scientific societies, such as the American Chemical Society, which owns the journal for which I am responsible, the American Institute of Chemical Engineers, etc. There is more change of opinion among the scientific men in the industry in these meetings than one would ordinarily suppose. I think it is quite generally recognized that it is worthwhile to tell something of what you know in order to gain from the other fellow. Some years ago there was a meeting of petroleum technologists, I understand, where there was a great air of secrecy and the men were asked, without signing their names or giving any pertinent information, to indicate on a slip of paper the one thing that they valued highest as a trade secret of their organization. These were put in a hat and afterward sorted out and it was found that 57% of the men present treasured the same secret. That is very likely often to be the case.

In order to give you some idea of the problems and trends in the industry, I want to mention some of the things that have been undertaken and carried through to success. For example, breaking a monopoly in materials nationally controlled elsewhere is, I think, always a worthwhile proposition in the United States because it enables us to avoid any pressure that might be attempted. I need only mention the fixation of atmospheric nitrogen which resulted from Haber's work in Germany and the improved American processes to illustrate the point I have in mind. Some said we could not fix nitrogen, but that has been done. Then they said: "You will never be able to make sodium nitrate in competition with Chile." That has been done and is being done by bringing the sodium carbonate made from salt in Syracuse, New York, and combining it with the nitrogen fixed at Hopewell, Virginia, on such an economical basis that we have actually exported considerable tonnages in competition with Chile. A recent development in California has broken the Chilean monopoly of iodine. You are probably familiar with the story of the superb physical chemistry research carried out on Searles Lake salts by the American Potash and Chemical Corporation which resulted in helping to provide potash and a number of other chemicals during the World War, with notable expansion since.

There is also the story of bromine, which is another example of research applied in the chemical industry to break a monopoly. In the old days Germany had a world monopoly of bromine and when the Dow Chemical Company, under the late H. H. Dow, began to separate bromine from brines in northern Michigan, Germany tried her policy of dumping bromine here at a low price and raising the price at home in the hope of driving Dow out of the business. I never knew the intimate details of how Mr. Dow learned a way to send bromine to Germany, as he did, and sell it at a high price while the Germans sold theirs at a low price here. That continued for a time and the Germans decided here was a man they would have to allow to remain in business.

High compression motors require anti-knock motor fuel, and bromine is essential in the use of tetraethyl lead fluid. There was not enough bromine in the wells in Michigan, and the fellows there, in working out ways of getting the utmost of it, even from the most dilute brines, developed a process which, with the cooperation of the Ethyl Gasoline Corporation, led to the Ethyl-Dow plant at Kure Beach about twenty miles from Wilmington, North Carolina. Bringing the sea water in contact with the chemicals for less than a minute, they separate 60 of the 65 parts of bromine per million parts of water at a rate that runs into hundreds of thousands of pounds of bromine every month. They are now pumping, or are equipped to pump, a hundred thousand gallons of sea water per minute and we are independent so far as bromine is concerned.

We have many examples of things that are produced to meet special needs. Let us take the most recent of our big industries - air conditioning. There was a great need there for a non-toxic, non-flammable refrigerant that could be used in large systems for apartment houses and other buildings. Dichlorodifluoromethane was developed and fully meets the requirements. There is something in that meter that certainly should inspire some poet to write about it - dichlorodifluoromethane. There was a case almost of an invention to order - just as with tetraethyl lead. You have heard Kettering talk and know the story of the development of tetraethyl lead. They had to know something about what took place in the cylinder before they found out what made the knock and the result was a search to control the flame propagation.

The development of new products is the one thing, I suppose, in which the industry is most outstanding. It is in a state of constant change. Some of the fellows begin to worry if no change is made in a process in five years. They think something must be wrong if nothing has happened to improve the process in that length of time.

The synthetic resin story is one of the best examples of the rapid growth of new products that have been synthesized. An experiment in organic chemistry did not yield the crystals expected and so the mess was thrown into the slop jar, but the research was reported in the journals. That was Dr. Baekeland's opportunity. He is frequently jokingly introduced as "the anonymous discoverer of bakelite." His was the first pioneering in synthetic resins that now run into hundreds in their trade names and special characteristics.

Rayon is another one of those good examples. It originated with Count de Chardonnet in the gay nineties when he thought he could do as well as the silkworm and began his work on the mulberry leaves. Now we know how to make it from any good alpha cellulose.

Kodachrome is another one of those simply impossible things. Perhaps I should tell you the story of the two musicians who conceived this idea of kodachrome. They knew they could not develop it without facilities such as might be had in the Eastman Kodak Company. That company became interested, contracts were made, and Dr. Mees told me that in 1933, when times were bad and the directors said they would have to spend less on development, he would have dropped this research and development because at that time it looked so unpromising but for those contracts which had to be fulfilled. The thing broke in March, 1935, and 16 mm kodachrome came on the market. By the middle of October they had sold $1,000,000 worth. Last year the 8 mm came on the market - and so on we go - impossible things!

If any of you fellows are movie fans and use the narrower film, as I do, you know how an 8 mm film can be projected giving the details of a great landscape. I would ask you then to remember that here we have a film base with five different emulsions on it, three of them sensitive each to a different color, with a neutral film between each of the three. In the development all the silver is taken out and what we have as a result of the 28 processes involved are three superimposed dyed images that give a beautiful effect on the screen. I say it is just as impossible as the farmer's giraffe or kangaroo, yet it is a modern development from the application of fundamental research to industry. My friends in the photographic industry tell me that within a decade we will all forget about black and white entirely; that we will be making color prints and everything in photography can be in color.

The manufacture of starch from sweet potatoes now going on in Laurel, Mississippi, is another indication of the development of a new product. Here is a starch being made from sweet potatoes that competes with other starches, particularly cassara, and so cuts down imports.

There is a long story in safety glass. Here again is a case of obsolescence. We started out with cellulose nitrate, went to cellulose acetate, and now we are using vinyl acetate and acrylic resins. All are successive improvements, each one tending to make obsolete what has been done before; obsolete because these newer things do not become brittle at low temperatures as does cellulose nitrate, they have better visibility, can be made in continuous sheets, and are better for the pressing of the glass on either side of it.

While on Cape Cod for the summer with my work, and hearing much about boats, I was very much interested in that quadrilateral jib of the Ranger - a four thousand square foot sail made out of "cordura" rayon, the first time rayon has been used for such a sail. The British expert, who was on the committee boat when that quadrilateral jib was broken out, commented on the radio: "The Ranger is going away equipped with a set of sails that we do not have -- some sort of a patent sail we do not know about." This patent sail which had been developed with du Pont "cordura" rayon, woven in the Wamsutta mills in New Bedford and cut, as they say, by an expert sail maker, was the first of that type of sail - lighter and stronger than canvas, woven so the air could not get through it. To decrease its skin friction and thus increase the driving force of the wind it had been given a coat of lacquer, and after a puff of wind had done its work it could slip by and get out of the way for the next puff. That was one of the major contributing factors to the impressive victory of the Ranger. That same "cordura" rayon is being tried out extensively in place of cotton in truck tires and has given tires a very much greater mileage than those employing cords made of the cotton staple. So poor old cotton has another field in which we find a synthetic material giving it some real competition.

Dehydrated turpentine is just coming out now as a result of work down in the Department of Agriculture. Most turpentine contains some free moisture, which causes corrosion of metal containers, discoloration from the rust, and of course a loss of grade of the turpentine. So the simple thing has been to take out the water and make a dehydrated turpentine that does not so corrode. This has resulted in increased production and is better, for example, than using the cracking process in it, for the use of cracking in any year means that we use about half the amount of crude oil to produce necessary gasoline that would be necessary without the cracking process, and that runs into something like over a billion barrels a year.

Synthetic dyes I have mentioned.

I dare say that synthetic rubber is something that has been of interest to you. It is one of the most interesting things in the world today because we have Germany with her Buna rubber, starting with acetylene, and promising to make by another year one-third of her requirements of rubber. We have Russia making a butadiene rubber from alcohol derived from potatoes and using potatoes from at least 750,000 acres of land, if they live up to their quota and plan for manufacture of rubber, with the intent of becoming independent in that respect. We in this country are making the new neoprene from chlorine and acetylene, and thiakol from chlorine, natural gas, and sulphur. Here, I am happy to say, our synthetic rubber-like material has been made because it is better for many purposes than the natural rubber and sells for a higher price, whereas on the other side it has been a question of the four-year plan in Germany, the effort to become self-contained; and it is a strategic material in Russia.

Camphor is another case of breaking a monopoly, in this case Japanese. We now make our synthetic camphor from American turpentine and can produce as much as we really need in our domestic industry.

The problems involved in meeting market changes are always very interesting. For example, there was made by a chemical process an impregnated, coated cloth for the tops of automobiles. That was a very large business until somebody decided to make the metallic top and then that market disappeared over night and there was a plant without a market! A very good job has been done in making instead a very lightweight silk-coated sheeting for hospital use, a fine raincoat material, and other sorts of similar things that are now taking the place of the production that formerly went into the tops of the automobiles.

I have spoken of the way cellulose acetate has replaced cellulose nitrate and how other things are now threatening to replace the acetate in the manufacture of safety glass. There are many other examples of that sort of thing.

We have the problems of industry that have to do with what use to make of products concurrently produced with the principal product. The manufacture of chlorine by the decomposition of salt always gives one caustic soda. Sometimes, and more recently, we have had more caustic soda than we have wanted; sometimes we have had more chlorine than we have wanted. What should we do in a case of that sort? One of the companies, the Allied Chemical and Dye Corporation, is working on a method whereby they do not have to make caustic at the same time they make chlorine - treating salt with nitric acid. They make nitric acid so cheaply from atmospheric nitrogen. What they have actually attempted is a much more difficult technical problem than sounds in statement. The whole balance of chlorine and caustic has been more or less upset because of new uses for chlorine - in sanitation, the production of new types of solvents that are chlorinated hydro-carbons, and similar new uses of chlorine - and has given us too much caustic for current needs.

There is a lot more that might be said about these problems of the industry. Mr. Kettering perhaps told you when he was here that one conception of a research man's job is to keep you reasonably dissatisfied with what you have so you will want the better things that come as a result of scientific effort. Of course it is that flow of new ideas that does underly all sorts of business progress. That is particularly true in the chemical industry, and the men are on the lookout for ways to improve their processes, to make their products less expensive, because here again if you will examine the statistician's curve you will find the chemical industry unique in that it has constantly striven for larger production at lower price. There is no price

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making in the chemical industry. The idea is that if you make the thing cheap enough there will be so many more uses for it that you will increase production and profit accordingly. Cellophane, I think, is an outstanding example of that. Cellophane was introduced in about 1923 and since that time there have been eighteen voluntary price reductions. Every time they have been able to make the stuff for less they have passed on a part of that savings to the customer. That has meant a broadening market demanding a larger production with still greater savings and down would go the price again. Eighteen times that has happened and it has not only created much good-will for the industry and increased the use of cellophane, but it has been most discouraging to competition. I think it is a far wiser sales policy than one frequently finds where an effort is made to keep the price up for all the traffic will bear, thereby inviting everybody to come and get in the business; and when everybody is in you have so much production that nobody can make any profit. That happens over and over again.

As long as new things are wanted, as long as there are imperfections in those things that are being made, and as long as there is just the natural curiosity concerning how things are made and why, I think you will find research being supported by the chemical industry and the industry itself along with the public benefiting greatly from the results. Thank you.