

RESTRICTED

NONFERROUS MINERAL RESOURCES

31 October 1951

549

CONTENTS

	<u>Page</u>
INTRODUCTION--Colonel B. D. Rindlaub, USA, Chief of Economic Potential Branch, ICAF.....	1
SPEAKER--Mr. Samuel G. Lasky, Special Consultant to the President's Materials Policy Commission.....	1
GENERAL DISCUSSION.....	10

Publication No. L52-46

INDUSTRIAL COLLEGE OF THE ARMED FORCES

Washington, D. C.

RESTRICTED

RESTRICTED

550

Mr. Samuel G. Lasky, Special Consultant to the President's Materials Policy Commission, was born in Denver, Colorado, 22 July 1901. He received his E.M. degree from the Colorado School of Mines in 1922, and his M.S. from Yale University in 1929. From 1922 until 1928 he held the following positions: refinery foreman, mill shift boss and superintendent of construction, New York and Honduras Rosario Mining Company, Honduras, Central America; instructor in chemistry, Colorado School of Mines; mine shift boss, Phelps-Dodge Corporation, Morenci, Arizona; mining engineer and geologist, Kennecott Copper Corporation, Kennecott, Alaska. In 1929 he began his government work, holding the position of geologist with the New Mexico Bureau of Mines and Mineral Resources, Socorro, New Mexico. In 1931 he joined the Department of Interior Geological Survey as a field geologist; during the war, he was regional geologist in charge of strategic materials investigations in the Western States, and later became chief, Mineral Resources Section. He was a student at the Industrial College of the Armed Forces, 1950-1951. Mr. Lasky is the author of many articles and books of a technical and scientific nature and the editor of "The Mineral Position of the United States." He holds membership in the following professional societies: American Institute of Mining and Metallurgical Engineers, Geological Society of America, Society of Economic Geologists, and Geological Society of Washington. He was appointed to his present position, upon graduation from the Industrial College.

RESTRICTED

RESTRICTED

NONFERROUS MINERAL RESOURCES

551

31 October 1951

COLONEL RINDLAUB: In our Natural Resources Course we have already had presented the world petroleum situation, the materials for the making of steel, and the situation with respect to light metals. Today we are going to have the final presentation in the mineral field. Mr. Sam G. Lasky, who was formerly head of the Mineral Resources Section in the Interior Department and who is now special consultant to the President's Materials Policy Commission, is going to speak to us this morning on "Nonferrous Mineral Resources." I think the positions that Mr. Lasky has held and holds now are adequate to show you why we have asked him to speak here this morning. So far as the faculty is concerned, Mr. Lasky is better known as a student and graduate of the Industrial College. Sam, we are very pleased that you could take time to be here and speak to us this morning.

MR. LASKY: Thank you, Bruce. General Vanaman and gentlemen: The last time I was introduced to a public group it was as Harold Laski. Harold Laski was a British economist who died a long while back.

The assigned scope of my lecture is as follows: Industry's dependence on nonferrous metals. What are the strategic and critical ones? Where, throughout the world, are they distributed? And then in conclusion, a brief summary of the relative positions of the "free world" and the Soviet Bloc, and the implications on United States National policy.

I shall follow the order of the assignment, but first, it would be well to define what is meant by the nonferrous metals. Those of you who have started your course in public speaking have been told that one way to describe something is to tell what it is not. That method is invited here by the very term "nonferrous;" that is, those metals that are not ferrous.

The ferrous materials are commonly considered as including iron ore and the alloying metals--manganese, chrome, tungsten, vanadium, molybdenum, and nickel. Cobalt and columbium are also coming to be regarded as ferrous metals.

The nonferrous metals theoretically include all others. In recent years, however, the light metals--aluminum, magnesium, and titanium--have achieved a classification of their own, and you have had, or will have, a separate lecture on them.

Then there are the precious metals--gold, silver, and the platinum group--which also are usually separately considered.

RESTRICTED

RESTRICTED

3552
That leaves but a small group consisting of the "big three"--copper, lead, zinc--and bismuth, cadmium, antimony, arsenic, mercury, and tin. Mostly it is the "big three" alone that is meant when one hears the phrase "nonferrous metals."

I have puzzled a great deal over how to describe for you industry's dependence on this group of metals. We should understand at the outset that world requirements for these materials are fantastic, and that, war or peace, these requirements will grow. Moreover, it looks as if they will grow at an accelerating rate. The people of the world are becoming aware of the meaning of the term "the American standard of living" and are wanting something like it for themselves.

It has been estimated that if the rest of the world were to become industrialized on the same scale as the United States, world requirements for minerals would be multiplied seven times. The United States offers a good example of how fast a nation's requirements can grow as it industrializes. For example, in terms of the 1935-1939 dollar, back in 1900 the aggregate value of all nonferrous metals used in the United States was, say, about 100 million dollars; in 1950, it was about 450 million dollars.

The United States alone uses 1.5 times as much copper and zinc as all the rest of the world, and three times as much lead. In 1950 alone the world consumed more than 3 million tons of copper, over 2 million tons of zinc, and nearly 2 million tons of lead. Incidentally, a couple of hundred million tons of ore had to be handled in order to get this metal.

Perhaps, though, a better way to describe industry's dependence on the nonferrous metals would be not to quote statistics but to consider what industry is for--the reason for its existence. Industry exists for one thing only--to make the things that people want, whether it be necessities, such as shelter and farm machinery; luxuries, such as cigarette lighters or television sets; or a 150-group air force and amphibious tanks.

Aside from the metals that go into the articles that are manufactured, the manufacturing plants themselves and the machines they use are made of metals. Next spring you will take a field trip to a major industrial center. When you do, notice the tremendous quantities of metal in the buildings and in the rows of machine tools.

I am still talking about the nonferrous metals and not of metals in general, for an industrial economy is so highly integrated and complex that it is, say, uniformly dependent on almost the whole gamut of resources. The oil enthusiast says: "Without oil, the Nation would die." So it would. But it would also shrivel without steel, or agricultural products, or sulphur, or the nonferrous metals.

RESTRICTED

RESTRICTED

553

I don't want to go into any great detail on data that you can pick out of any standard reference book, but consider briefly the industrial uses of these metals. Copper is used mainly in telecommunications, in light and power generation and transmission, in heat transmission, in building construction, and, of course, with zinc, in brass. Lead goes mainly into storage batteries, cable covering, paints, solder, and building construction. About 10 percent of all that is used is shot away in tetraethyl. Zinc is used mainly in galvanizing, die-casting, paint, and in brass and bronze.

Antimony is used especially in antimonial lead for storage batteries and for type metal, and for flameproofing. It makes type hard and sharp. The canning industry needs tin. Cadmium is used for hard alloys, in bearings, and for electroplating. Bismuth is used for low-melting alloys--such as are used in fire sprinklers--solders, bearings. Mercury is used for antifouling paints and in certain electrical instruments.

Perhaps the outstanding feature of a modern industrial economy is its reliance on transportation, electric power, and telecommunication, all of which, in a sense, grew up in part around the peculiar properties collectively owned by the nonferrous metals. For example, the automobile--without which, as we saw during the war, our industries would probably fall apart for lack of labor--contains about 40 pounds of copper, as well as lead and antimony in the batteries, and tin and lead in the solder; a truck contains from 50 to as much as 400 pounds. With present automobile design, denial of a ton of copper would force the same cutback in production as would the denial of 95 tons of steel.

I can summarize our industrial dependence on these metals by simply referring to our national stockpile of strategic materials, which represents the public recognition of this dependence. In due course, aluminum, magnesium, titanium, and various other materials will take over part of the burden now carried by the nonferrous metals, but the technologic battle will be hard fought.

It is this dependency that makes the materials of the stockpile strategic and critical. By definition of the Munitions Board, strategic materials are "those essential to the national defense, for the wartime supply of which dependence must be placed in whole or in substantial part outside the continental limits of the United States, and for which strict conservation and distribution control measures will be necessary." Critical materials are materials that are needed but the procurement of which would be less difficult.

By these definitions, all the nonferrous materials--except arsenic--as defined for this lecture are currently listed as strategic and critical.

RESTRICTED

RESTRICTED

554

Currently, the United States imports a third of the copper it uses, a third of its zinc, nearly half of its lead, virtually all its tin, three-fourths of its antimony, and more than nine-tenths of its mercury. It is estimated that by 1975 the United States will be depending on imports for two-thirds of its copper, lead, and zinc.

A similar sort of dependency exists in every country of the world, for no country has within its own borders all the materials it needs. Russia is trying to make the Soviet orbit self-sufficient by insisting on getting along with what it has, but it could use a good deal more of most metals and minerals if only it had them.

In past generations the world's ability to provide kept pace with its needs. That is now no longer true. The miners of the world do not produce as much as the peoples of the world want to consume.

This reference to foreign dependency brings me to the next part of my subject, namely, where are these metals distributed throughout the world?

So far as geologists now know about such things, nature has created eight distinct copper "jack pots" in the world. Four of these are in the United States--Michigan; Butte, Montana; the Utah-Nevada ellipse; and the New Mexico-Arizona circle, extending down into Mexico. Some of the mines in this region are names to conjure with--Bingham Canyon in Utah; Morenci, Arizona; Butte, Montana.

The other four are the nickel-copper region of Sudbury, Ontario; the Chuquicamata and Braden areas of Chile; and the bologna-shaped region of Northern Rhodesia and the Belgian Congo. These also are names to conjure with. One estimate says there are 75 million tons of recoverable copper in known Chilean deposits, contained in 5 billion tons of ore.

Politically, we may say there are only five copper regions--the United States, Canada, Chile, Northern Rhodesia, and the Congo. These five regions account for almost eight-tenths of the world's current production of copper and for somewhat over eight-tenths of the world's copper reserves. Russia is the world's fifth largest producer and also ranks fifth with respect to reserves, but its production is scattered. Subordinate, but important, copper producers are Peru, Scandinavia, Yugoslavia, Cyprus, Australia, and Japan.

The American Smelting and Refining Company is carrying on exploration work in Peru, as a result of which we may soon include Peru among the natural jack pots I speak of.

Having mentioned reserves, I must digress here to explain the meaning of that term. It is much abused and much misunderstood. As commonly used and unless otherwise qualified, the term "reserves" applies only to the material that can be mined, processed, and marketed

RESTRICTED

RESTRICTED

555

without financial loss under prevailing costs and technologic conditions. At all times there is known to be present, in the ground material so low in tenor or of such refractory quality that it is deliberately excluded from reserve estimates. When such stuff is included in estimates it is called submarginal reserves.

Moreover, estimates of reserves make only limited allowance for future discovery, even though we know that new ore will be discovered tomorrow and the day after. The common practice in the mining and petroleum industries is to explore for a new ton of ore--or barrel of oil--for every ton--or barrel--taken out.

By no means is it justifiable to divide a reserve figure by current rate of production and then to say, for example, that our petroleum deposits will be exhausted in 14 years. Reserves are the working inventory--the stuff on the shelf. There is always some more of the stuff in transit; the ore currently being found; and more still on order--the ore that will be found by the new exploration currently being started.

Now to return to the material itself. I have discussed copper, now for lead and zinc. Although there are some deposits that contain only one or the other, usually lead and zinc occur together in nature. There do not seem to be quite the jack pots that we find for copper, but there are some regions where Nature did seem to make a special effort to cache away the material--as in the Coeur d'Alene district in Idaho, the region around the junction of Missouri, Kansas, and Oklahoma--what we can call the tri-State district--and Broken Hill in Australia.

Politically, the major lead-zinc producing areas of the world are the United States, Canada, Australia, and Mexico, which yield better than two-thirds of the world's production and contain a little over half of the world's reserves. Good runners-up are French Morocco, Peru, Germany, Yugoslavia, and Russia.

Bismuth and cadmium ought to be considered next because they are by-products of the production of lead and zinc--bismuth from lead ores and cadmium from zinc ores. For that reason, too, we can dismiss them with no further mention because their occurrence is the same as that of lead and zinc.

Arsenic also is a by-product, from the smelting of lead and copper ores. In many lead and copper minerals, the lead and copper are chemically combined with arsenic and antimony and are separated from them only in the smelting process. About two-thirds of world production of antimony, however, comes from antimony ores as such.

South China is the world's big antimony jack pot and formerly produced half of the world's supply. The next two major antimony regions are Bolivia and Mexico, followed by the United States, the Union of South Africa, Yugoslavia and Czechoslovakia.

RESTRICTED

RESTRICTED

556

The tin treasure vault of the world is here in this region (referring to map) from South China, Siam, and Burma down through Malaya, Indo-China, and Indonesia (map was not reproduced). A second vault is Bolivia and a fair amount comes from southern Africa, particularly the Congo. The tin mines of Cornwall, England, were once the world's biggest source. The Cornish miner has left his mark around the world.

Mercury is the last on our list. The outstanding centers of the world are Spain and Italy, which produce two-thirds of the world's supply. There is some also in Mexico, and a little in Canada, Yugoslavia, China, and Russia. The United States in past years has managed to satisfy much of its needs from a couple of great deposits in California and others in Oregon, Nevada, and Idaho; but American deposits are now of minor world importance. The mercury industry in the United States is virtually dead, although American mines still contain some ore that might come out during periods of high prices. American ores are extremely low grade as compared with Italian and Spanish ores.

By and large, then, the world's deposits of the nonferrous metals are distributed worldwide, although doubtless you have noticed the frequency with which some countries were named as major sources--for example, the United States, Canada, Bolivia, Mexico, and Yugoslavia. Perhaps, too, you noticed that most of the regions named are in the free world. With the exception of antimony, the free world contains an overwhelming proportion of the world's known resources of nonferrous metals.

All told, the free world has nine-tenths of the world's copper and lead reserves, and eight-tenths of its zinc reserves. A tenth of the world's lead is in western Europe and half of that amount is in Germany. The free world has 97 percent of the mercury and three-fourths of the tin but only a third of the antimony. Half of the mercury is in Spain alone and most of the rest is in Italy.

Note that it is China alone that has the Soviet-orbit supply of tin and antimony.

Location of these resources mainly within the free world is not necessarily, however, a cause for complacency. Does free-world political control necessarily weaken Russia, or can Russia get along with the little it has? Does China's control of antimony necessarily strengthen the Soviet position and weaken the free world, or can the free world get along without much, if any, strain?

Moreover, there is a big gap between existence of the metal in the ground and its being put to use. The copper in South America must somehow get to the United States and that from Africa must get to Europe--its normal markets--before it will do us any good. Lead and zinc must

RESTRICTED

RESTRICTED

557

find their way from Africa and Australia to European industrial centers; the atimony must get out of Bolivia and Mexico and the tin out of Bolivia, Africa, and Southeast Asia.

Before that, these metals must be mined--with unskilled native labor and against the further obstacles of a shortage of equipment, power, transportation, and port facilities.

Political, economic, and social problems in these foreign areas also are factors. For example, tin reserves in Malaya are declining, but the agricultural element is opposed to extending mining into new areas. Another example is Bolivia, whose welfare also is based on tin. Bolivia is trying to sell its tin to the United States at a price higher than the world market price. Do we pay Bolivia's premium price or do we refuse to, and thereby possibly strain its economy?

The starkest problem of all is whether the countries presently in the free world remain friendly, or at least remain as a source of raw materials to the free world. The nationalism currently spotlighted in Iran is showing up in virtually all countries recently escaped from colonialism. The peoples of these countries want a closer relationship than they think now exists between their welfare and the raw materials they produce. They may try to industrialize on their own--or they may simply refuse to ship raw materials to us. Iran demonstrates that what we consider to be economic logic has no great influence with these countries.

Whatever may be the immediate cause, it would be no more strange to have appear on the Soviet side some of the countries now listed as within the free world than it is to see Yugoslavia listed among the free nations. There is always the possibility of defection to the Communist side, military capture, or destruction of a nation's capabilities in some fashion.

It looks as if we can expect the split between the so-called western and Soviet orbits to continue for a long while--10, 20, perhaps 50 years. If so, can we continue to find enough new ore to maintain our relatively strong natural resources position?

I told you that "reserves" constitute only a country's working inventory, which must be replenished by new discoveries as it is used. Considering the great extent of Russian territory, the chances are good that it will have no trouble on that score in order to support its tight economy. On the other hand, it is at least debatable whether we here can support our luxury economy into an indefinite future of "cold war."

If "hot war" comes, is the current productive capacity of the free world great enough to meet its requirements, and can we keep; the supply lines open?

RESTRICTED

RESTRICTED

558

All these questions and implied contingencies have obvious impacts upon our national policies. An attempt to answer these questions would be beyond the scope of this lecture even if I were professionally qualified; and without answers to them no policy suggestions can be given, but we can list some of the policy issues as such and some of the policy decisions that have been made.

As soon as we consider policy, however, we have to think of raw materials in general, and not just nonferrous metals. The Point IV program represents one policy decision with respect to some of the problems mentioned; the United States is committed to giving technologic and economic help to underdeveloped countries.

Those activities of the ECA that call for American acquisition of raw materials for our stockpile represent another policy decision, and the Stockpiling Act still another.

The operation of the stockpile is in itself creating new policy questions. Great Britain also has a stockpile and perhaps other industrial countries would, too, if they had the money for it. The tremendous quantities of raw materials being stockpiled are being totally subtracted from productive use and their emasculation is putting a tremendous strain on world economy. Stockpiling is thus one of the big pressures behind world inflation. Do not get me wrong! I am not arguing against stockpiling. I am only pointing up some policy issues for you.

The North Atlantic Pact envisions that the several nations will each make the military supplies it is most fitted to make. If they are to do so, they are going to need raw materials and they are going to have to be able to buy them at a price they can pay. They can't afford any such price as 44 cents a pound for copper.

No longer than eight months ago, an International Materials Conference was set up in order to create some equity in world supply and has already agreed on international allocations of molybdenum, sulphur, tungsten, copper, and zinc.

Within the past couple of months the National Production Authority has set up a Foreign Facilities Committee in order to see that major foreign raw-material projects, among others, get the American equipment they need to get under way.

Recently we reached an accord with Spain. During all the discussion pro and con that went on for a year before that action was taken, I wondered how much weight was being given to the fact that Spain has half the world's mercury--or that there is a good deal of tungsten in the Iberian Peninsula.

RESTRICTED

RESTRICTED

559

Other policy issues are those relating to possible economic warfare against the countries in the Soviet orbit. The blockade of China that was proposed some months ago is an example of this type of issue.

Recently, there have been modifications of the tariff on some of the nonferrous metals. Should we have free-world free trade or shouldn't we? Should we subsidize high-cost American producers, or, instead, should we try to meet all our shortages from abroad?

But then, are we satisfied we can keep shipping lanes open or should we subsidize excess domestic capacity so that, with the further aid of the stockpile, we can be self-sufficient if we have to?

As a matter of fact, are we sure we have the raw materials to support such excess capacity?

Toward the end of your course you will start to make up your minds about some of these things, and when you leave the college on your next assignment you will begin to take part in making the decisions. To my mind, there are six salient points that you will base your decisions on with respect to the nonferrous metals:

1. The major sources of each metal, and for various groups of them, tend to be concentrated in certain parts of the world.
2. Except for antimony, the free world has a predominant part of the world's known supply.
3. China has the metals--antimony and tin--in which the Soviet orbit is well off.
4. A good part of the United States supply comes from Canada and Mexico.
5. Although the free world does control so much of the world's supply, some of the sources are a long way from established industrial centers.
6. The policy implications of these facts tangle with a host of controversial domestic and international issues.

The "Great Debate" of about a year ago on whether the United States should pull out of Europe, Asia, and Africa was based pro and con as much on raw material considerations--including nonferrous--as on political considerations. I have heard the opinion expressed that the United States developed its tendency toward isolationism because we possessed such rich and balanced resources within our own borders--that otherwise we may have become just as imperialistic as did the other nations of the world. Britain, Italy, Belgium, Holland, France . . . they

RESTRICTED

550

virtually had to expand in order to be sure of a raw material supply. Now the United States realizes that its needs have outstripped its domestic capabilities. What do we do about it? Russia is trying to solve its problem by its own brand of imperialism. The free world, on the contrary, says that imperialism is a thing of the past.

I can think of no better note on which to close this lecture.

QUESTION: I get the impression that there is plenty of zinc in this country, particularly in the sections shown on the map there. Yet I understand that NPA has found it necessary in the present expansion of our industry to dip into the stockpile of zinc and allocate it to industry to get going in the program. Why is it? Why can't they take it from the ground without going into the stockpile?

MR. LASKY: Present production of zinc is geared to our present reserves and present physical capacity. It takes a certain amount of ore in the ground to support a given production. We don't have any figures on this ratio for the metals, but for petroleum, for example, it takes 14 barrels in the ground to support one barrel of production. What you have is a working inventory with allowance made for turnover; the 14 barrels represents turnover. Moreover, you can haul just so much ore through a given shaft and no more. Even though there be additional ore down there in the ground that could support new production, you would still have to open new galleries and new shafts, and you would have to hire more men. The simple answer is that domestic zinc mines are already operating at capacity. Does that cover your question?

QUESTION: It does in a way but it doesn't. If that is such a critical item that goes into new plants, they are making facilities for other metals, why haven't they done the same thing for zinc?

MR. LASKY: Programs for increasing zinc production are in progress. They take time. Although we do have reserves there is only limited flexibility in the way of increasing production. You can't increase production indefinitely simply by crowding on more men and more capacity. Even if you could do it, it takes a long time to sink shafts, to dig tunnels. Zinc production in this country will grow to some figure moderately larger than at present, but it will never grow to the point where the United States will be anywhere near self-sufficient. We import one-third of our requirements. Domestic production is reaching a plateau whereas requirements are growing like that (indicating). No matter what we do, that long-term spread is still in existence. If we try to push up production now without finding new deposits, it will be a forced-draft operation, and after a while we will have to stop to catch our breath. Then at that time production will fall away below normal.

GENERAL HOLMAN: I have two questions. The first may be somewhat away from the scope, but you said nothing about tungsten and you may have grouped that with your ferrous metals. Looking at the requirement

RESTRICTED

RESTRICTED

501

for high-speed tools and armor plate, it looks to me as if it is a very important commodity. Now looking at the tungsten situation as being a very urgent requirement, what is it that keeps exploration going? Is there any possibility that, outside the limited areas of China and Korea, exploration in other parts of the world lack incentives, the urge to get metals which are very short or to develop veins in other mines for some of these rare metals, where they are very isolated in certain localities, using tungsten as an example?

MR. LASKY: Tungsten, or you can take any metal or mineral as an example--the problem is always the same Discovery depends on many factors. Geologic knowledge is one. For some metals we know a good deal about the geology, for some we know little. For copper, lead, and zinc we can say that we know where in the United States would be the places to look for new deposits, because we know the geology of the United States very well and because we know a good deal about the geology of occurrence of the metals. We know the geology of the rest of the world much less well so we aren't quite sure where to look in the rest of the world except, in a general way, in the "jack pot areas" I spoke of. For example, we know that the mountain ranges of South America constitute good copper country. On top of that we know that the country is not well populated, not well developed, so that deposits that may be there may not yet have been stumbled on. We are trying to develop better techniques, mainly from the air, to help prospect such areas in a hurry. One such is colored photography. Colored aerial photographs of supposed promising country are taken into the laboratory and looked at through color filters; you filter out the colors you don't want and have left only those--in the form of soil or vegetation color--that mean something in terms of mineral deposits. That is the sort of thing that will help to open up countries hard to get into.

For other materials, such as columbium, we know very little about the geology of occurrence. Uranium might be cited as an even better example. When World War II started we knew next to nothing about uranium, but as we have continued searching we have begun to learn more about it. As a result we are being more and more successful, and we will probably continue to find more uranium both within the United States and throughout the world. We are now beginning to learn a bit more about columbium and will probably find more of that.

The next thing needed for exploration is money; exploration requires capital. Next is the likelihood profit; exploration is not carried on unless there is an opportunity for making money. Large explorations are being carried out by American capital in foreign countries and some of these are under American control. But in recent years underdeveloped countries, as they pick up their own governments, have begun to want to do things their own way. Years ago Mexico expropriated the petroleum industry. Iran has now done the same thing. The present trend in foreign development is for the foreign government to retain ownership control--say 51 percent--and for the American capital to hold on to

RESTRICTED

RESTRICTED

552

technologic control and the managership. You will hear a lot about taxation; high taxes certainly are holding back exploration worldwide. In some foreign areas the minority interest gets taxed somewhere about half of its profits--don't hold me to this particular ratio but it makes my point. The American government takes an additional cut. Capital doesn't see any sense in investing when it can't get a big enough profit out of it. Mining for ores is a risky business in anyone's language and the profit has to be in proportion.

COLONEL BARNES: I suppose you have given a lot of thought to this atomic energy method of transmutation of metals. I wonder what you really think about it as a practical matter for a future supply of some of these scarce metals by taking those less scarce and making scarce ones out of them?

MR. LASKY: Here is where I bow out as any kind of expert. I can only parrot what I have heard by hanging around some of the experts who are working with the subject. There is a divergence of opinion as to when we will have atomic energy as a day to day thing. If we achieve day-to-day atomic energy, we will be able to handle uranium as we please and some of the other fissionable materials as well. Whether we will have to go beyond uranium and thorium, I wouldn't want to make a guess, outside of guessing, for instance, that we will find enough uranium and thorium and that we will learn how to treat the stuff expertly enough so we won't worry about any other elements or any future transmutation.

COLONEL WATERMAN: Sam, is there any thought being given to producing a large-scale-requirement metal, such as copper, out of some other metal which is in adequate supply? Can that be done, and is it within the realm of feasibility?

MR. LASKY: I don't know a darn thing about it. My opinion is, it is not. We will never come to it. The chances are that before we are faced with a problem like that we will be able to use magnesium or aluminum or some other element that we have in endless quantity. That is tied to the energy problem. If we can get the necessary energy for extracting these materials from the rocks and have the time to figure out the technology, we probably are well off. Also there are endless opportunities of combining organic with inorganic compounds to make brand new compounds.

QUESTION: How do you go about getting a peek behind the Iron Curtain so you are certain what the USSR has in mineral resources that have been discovered since 1940?

MR. LASKY: The peek isn't hardly even a peek. Many books have been written on Russian resources. What I quoted was a comparison between estimated reserves for the free world and estimated reserves behind the Iron Curtain according to the best judgment of people who have been trying to peek. The way they do it is to take the figures that are available for what they are worth, watch the economic pattern as it develops, the

RESTRICTED

kinds of materials being used, watch the trade flow, and interpret all of that in terms of the geology of the country and what information seems to leak out about the amount of exploration and research that the particular government is sponsoring. In any event these reserve figures have quite a large margin of error even for the United States. That margin of error will be still greater for the rest of the world and even still greater for Russia. The qualitative conclusion, however, is probably much as I mentioned it. Don't try to put a fixed quantitative tag on it.

QUESTION: What is the present status of negotiations with Bolivia with regard to the price of tin and why wouldn't it be advantageous to the United States in the interest of a long-term contract to pay at least somewhere near the price of what the Bolivian Government of interests are requiring, as compared with the cost of a Point IV program, for instance?

MR. LASKY: The RFC is handling that problem. As I told you, answering some of these policy matters is quite beyond my professional capabilities. You yourself can come to as good a conclusion as any one might. Right now we must have tin. We also want a solid Western Hemisphere. At the same time, we have the American public, the American Congress, and such items as the national debt and the amount of money we are spending--that sort of thing. So we end up with a decision that is a sort of compromise between what we would like to have and reality.

QUESTION: During World War II, as a means of increasing copper production, allowances were made in the price of copper, based on the cost of production; various mines in Butte had this allowance, based on their costs. I think mines in Michigan were allowed quite a bit more. Is such a plan in operation now or in prospect for speeding up production?

MR. LASKY: Strictly speaking, I don't know. I don't believe any subsidy plan is in operation now.

QUESTION: Will they bid in the open market then?

MR. LASKY: I will have to beg off. I have been working on other problems with too much concentration to know the details of the matter. There are in existence certain subsidy plans designed to get out more production. One is the grubstake plan whereby the Government pays most of the production cost by means of long-term contracts. There is also an exploration subsidy plan. I don't know the details of how those will be operated. There is a man in the audience who does.

QUESTION: In your lecture you mentioned the Point IV program. Would you say whether you think the Point IV program is likely to improve the position of the United States in its accessibility to metals in other parts of the world which are not too accessible at the present time?

RESTRICTED

564

MR. LASKY: The United States has always been dependent on foreign sources for a good part of what it needs. We are virtually 100 percent dependent on imports for one-third of a hundred-odd metals and minerals we use, such as tin and quartz crystal. We are partly dependent for another third, including copper, lead, and zinc. The dependence is proportionate to the spread between domestic production and our requirements. But the rest of the world wants some of that stuff, too, while at the same time the world is unable to produce all that the world really wants. I don't see how the United States is going to continue to get all it desires from the rest of the world, since it would have to be at the rest of the world's expense.

I can't see how the American standard of living can continue to rise at the rate which it has been rising. If the raw-material producing countries really go for nationalism in the way they seem to have started and impose real export controls--the countries that are escaping from colonialism well might--then the American standard of living might even drop. If the free world has to build up to a military position where it can "roll with the punch" if Russia hits, and if it tries to stay in that position for the indefinite period of cold war that is now envisioned, then it seems almost certain that the civilian economy will not be able to have the luxury items it has become accustomed to and that spells out its standard of living. Consider how much will be locked up in security stockpiles. More is "lost" that way, in a sense, than if we have a shooting war. In a shooting war we get something back in scrap, but if we stay in a position of readiness for "n" decades, we lock up the stuff permanently.

One element in the shortage is the time factor. When we start out to search for minerals--even in the United States let alone South America or Africa--and we do the geological work necessary to see whether a place is worth drilling, then do the drilling and sink the shafts, it adds up to 15 or 20 years before we get quantity production. In view of all this, a program something like Point IV becomes essential. The people of the rest of the world don't have the technological background nor the money either to search for ores or to develop and mine them. So we have to give them both technical and economic help. Depending on which side of the fence you sit, you can say we are throwing money down the drain--carrying the rest of the world--or you can say we are doing it out of enlightened self-interest or take some position in between if you want.

QUESTION: We understand that in the very nature of steel production, for instance, and aluminum they use a lot of scrap--25 percent. Is the availability of scrap copper, for instance, worth while considering? Is the Government making a concerted effort to get that into use?

MR. LASKY: We already get good recovery of the nonferrous metals. Lead in batteries, for example, 80 to 90 percent or more of all the lead used is scrap turned in. There is good scrap recovery in copper; not so

RESTRICTED

RESTRICTED

505

much in zinc. There is little leeway for improving the recovery of scrap. That sort of thing is being pursued but the opportunities left aren't too great. Of course as the population grows and we keep mining more stuff and putting it into use year in and year out, the amount of scrap coming back gets greater, but it doesn't take care of the big gap between what we produce and what we require, not by a long shot.

COLONEL CAVE: Relatively how significant is Japan?

MR. LASKY: Japan is one of the good runners-up in world copper production. It would place down about seventh or eighth--I am just trying to pick a figure out of memory what it would produce if the mines were rehabilitated. Japan isn't anywhere near the top anyway. From the fellows who have worked on Japanese copper deposits, I understand it does have some fair discovery possibilities. I would put it down among the "also-rans."

QUESTION: I would like to ask you to explain the term "known reserves" which we use and which I consider a sort of evasive term. What percentage of the surface of the earth has been adequately explored and cataloged, and do we know what the mineral resources are?

MR. LASKY: On that phrase "known reserves"--engineers don't estimate reserves unless they know or have some positive evidence of the reserves existence. That is why the figures make relatively little allowance for new discoveries. When we say "known reserves," we are just trying to make sure someone doesn't think we are saying more than we mean. Now as to your specific question. I have never calculated and haven't heard any figure for the total mineral resources of the United States. The surface has been pretty well explored but there are good discovery possibilities deeper down. Deposits don't always crop out. Appraisal of the kind you refer to calls for a technique that is not as yet sufficiently developed.

For the rest of the world, my guess is that Chile has been fairly well explored, maybe Peru--that general copper belt. At the same time, these countries can't be anywhere so completely explored as is the United States. It is so difficult to get into parts of them. Africa is probably still less well explored.

QUESTION: I was thinking of the Tibetan area. Has there ever been any exploration in that area?

MR. LASKY: I don't know.

QUESTION: I have two questions: One, on the map there you find the mountain ranges through North America and South America have been fairly productive in minerals. When you get up toward Alaska it seems you don't have any deposits at all. What is the prospect of minerals in Alaska? The other question: What is the effect of international combines and cartels in world metal production?

RESTRICTED

RESTRICTED

566

MR. LASKY: In answer to your first question, Alaska has been a good producer. One of the largest deposits of copper ever discovered was at Kennecott, Alaska; it was the beginning of the great Kennecott Copper Corporation. Alaska has been productive in the parts that are exposed and it would be a matter, let us say, of more geological mapping and the development of techniques to probe under the ice and frozen soil cover to search for new deposits.

Now as to the cartels--there have been and are cartels. There is a diamond cartel and there is a mercury cartel--both of them are very active. They control world production and control world price. It was the activity of the mercury cartel, as a matter of fact, that cut the bottom out of the American mercury industry about three years ago, suddenly cutting the price of mercury about half, I believe it was.

QUESTION: Is the cartelization of the mining production to our advantage or disadvantage and if it is to our disadvantage what are we doing about it?

MR. LASKY: You mean foreign cartelization? American laws don't permit cartels here. I have never thought of the question before except in a general fashion, but I can't think of any advantages. As to the disadvantages of having any foreign group control production of raw material that we must have--well, we are simply at their mercy.

QUESTION: Could I ask you to stick out your neck again, especially in view of the fact of what you said of what we know about Russia. Would you tell us what the comparative intensity of exploration is in various parts of the world at the present time? We have the idea--I think most of us--that we are doing more in the United States than anyone else is. What is the situation?

MR. LASKY: Exploration actions by commercial interests is probably at a more intense rate now than it has been for years. Let us say: Exploration since the late years of the war until now is at an intense rate; ore is being found but not at a rate fast enough to take care of requirements or we wouldn't have this increasing import demand. American mining capital is also intensely active in foreign countries. It was American capital that led to the big development in French Morocco. American capital always has been active in South America. But that sort of exploration has been slowed up by the increasing demands from foreign governments as to terms.

What Russia does, again nobody knows, but there are reports that Russia is carrying on a fantastic amount of exploration. It probably isn't fair to compare what Russia is doing with what we are doing because all of its activity is government sponsored. The United States has a certain number of government geologists looking for ore but only in a very small way and mainly as a long-time research function.

RESTRICTED

RESTRICTED

507

COLONEL RINDELAUB: Our time is about up. You have done a fine job for your old Alma Mater and I express our appreciation. Thank you very much.

MR. LASKY: Thank you.

(14 Mar 1952--750)S/sgt

17

RESTRICTED

C61495

588

... ..

...

...