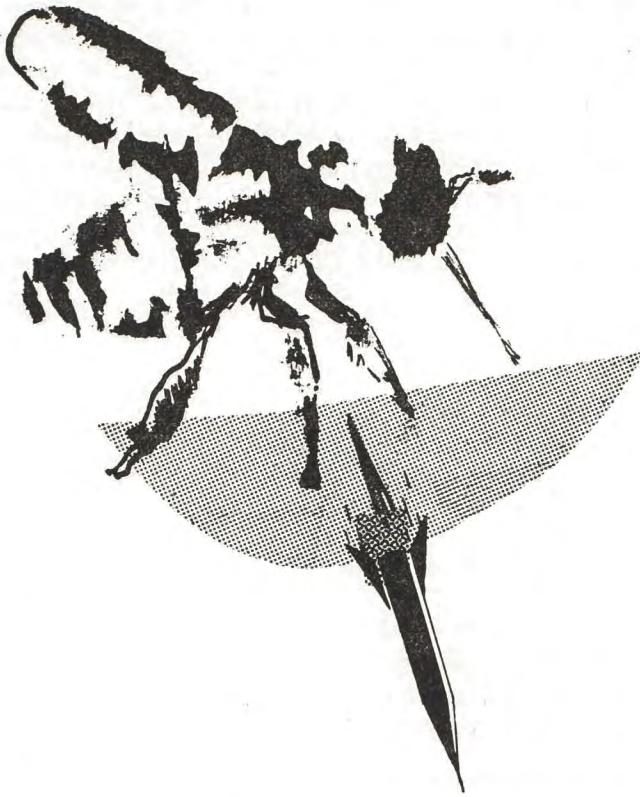


LEO SZILARD

The "Sting of the Bee" in Saturation Parity



On May 19, 1964, Leo Szilard wrote in a letter to an English friend, "In October of last year I spent ten days in London, much of the time in the shadow of the shadow Labor cabinet. . . . It looks to me that we are not going to make any significant progress toward any real arms control and I believe that in its absence proliferation of atomic bombs will not be avoidable in the long run.

"The enclosed manuscript, 'The Sting of the Bee in Saturation Parity,' is based on this belief. I wrote it after my visit to London, primarily to stimulate discussion among those in the Labor Party who are supposed to make up their minds on the issue of the bomb. I was amused to find that I could not get this article printed in England—if I wanted to. Political thought appears to be at a low ebb at the present time in England. I wonder whether this is going to change after the elections."

The manuscript that is described in this letter never did appear in print, and the Bulletin is pleased to have received permission from Gertrud Weiss Szilard to publish it now. Although written one and a half years ago, the article is as fresh, prophetic, and disturbing as its title.

When America and Russia will be in the position to destroy each other to any desired degree by an exchange of strategic atomic strikes, the nations of Western Europe will face a situation for which there is no precedent in history. On this occasion I do not propose to discuss the larger issues which will confront the world when nations can destroy each other in a rapid exchange of strategic strikes; rather, I propose to examine here only what France, Germany, and England may do in order to safeguard their own security.

If a conflict between Russia and America had led to an armed clash a few years ago, and if at some point along the line of escalation, Russia had made a sudden attack against America's strategic air bases and rocket bases, then America's residual striking capacity would have been sufficient to demolish, in a counterblow, all of Russia's sizeable cities. If, conversely, America had made

while, the tidelands road that was to have provided access to the plant is causing mud to move into and impair anchorage areas in the bay, presenting the supervisors with more vexing problems. Property values in the Bodega area, however, have increased since the PG&E withdrew.

Those concerned with the orderly development of atomic energy should ponder this affair soberly. How was this situation allowed to snowball out of control, to drag on for years after the issue of geological unsuitability was publicly raised, and result in the unnecessary expenditure of some \$4 million? One rumor has it that Bodega was originally intended to have been the first big commercial reactor on the Pacific coast, but was deferred in favor of the smaller plant on Humbolt Bay. Did the Atomic Energy Commission aid and abet the Pacific Gas and Electric Company in its callous disregard of other values from the very beginning? It is the outspoken opinion of William M. Bennett of the California Public Utilities Commission that the AEC is the chief party at fault in this affair. There were also rumors that for the last several months the AEC had been trying to persuade the PG&E to withdraw to avoid bringing the issue to a public hearing. To what extent was this situation prolonged by obstinacy on the part of a company that sincerely believed in its own omnipotence to circumvent all obstacles? What part did AEC Chairman Glenn T. Seaborg have in this affair, especially during the time when he was chancellor of the university at

Berkeley? There are many such questions for which answers will be sought, as the battle of Bodega is studied by citizens and legislative committees.

The real lesson of the battle of Bodega Head, as Harold Gilliam wrote in the *San Francisco Chronicle* of November 22, is that "There is no agency in the state of California to protect the people's interest in maintaining open space." The battle was won on the basis of geological uncertainty, yet it has been part of the growing movement in California to prevent the destruction of California as a livable environment by the freeway builders, subdividers, and industrial developers. Conservationists made a symbol of Bodega, not through fear of progress and nuclear power, but out of sober realization that ways must be found to stop the headlong destruction of the environment. Call it obstruction to progress if you will, or call us "nitwits and crackpots," but do not underestimate the real human need for a livable planet and the right of our descendants to have something better than a vast nightmare of freeways, transmission towers, and unsightly suburbs on our best agricultural land. Had the PG&E prevailed in its attempt to convert El Camino Real of the Mission Fathers to El Camino de los Kilowatts, we would indeed have lost ground. Now, perhaps, there is a little breathing space for both sides to reconsider a more sensible siting policy for reactors. One thing is certain: the Pacific Gas and Electric Company will never be quite the same again.

THE BALLAD OF BODEGA HEAD

(Selected verses)

Music: from a random number table

Words: Anonymous

*Out on the beach of Bodega
Stands a professor named Hand;
He's tearing his hair, the fauna ain't there;
The Isotopes splatter the land.*

*The mutants converge on Bodega
And lumber right out of the water:
Both saprophytic and hermaphroditic—
Would you want one to marry your daughter?*

*Now that granite rock of Bodega
Is cracked up in dozens of ways,
So when there's a quake, the whole thing
will shake,
While everyone solemnly prays.*

*Now what will become of Bodega,
That rock by the sounding sea?
Deep down in the hole there moans a lost soul
Who mourns for the PG&E.*



such an attack against Russia's air bases and rocket bases of known location, Russia's residual counterblow could not have caused any comparable destruction.

Today, America's strategic atomic striking forces might still be superior to those of Russia, by a factor of between three and ten, in the number of hydrogen bombs that they could deliver and, presumably, America could maintain this kind of numerical superiority in the years to come. She could not however, by doing so, keep Russia from steadily increasing her residual striking capacity. In recent years, Russia has steadily proceeded with the hardening of her rocket-launching sites and the building of additional submarines capable of launching long-range rockets, and today she has reached a point where her residual counterblow would be sufficient to demolish America's twelve largest cities, totaling over 25,000,000 inhabitants. This is a higher price than America would be willing to pay for reaching her political objectives in any of the conflicts that might be expected to occur in the predictable future. In other words, Russia's "residual striking capacity" would be sufficient today to inflict "unacceptable damage" on America.

It is conceivable that America's striking forces might still be superior to those of Russia in the sense that if it came to an all-out atomic war today, America would lose all her major cities on the eastern seaboard and some of her cities in the west, but she could still recover from such a war, whereas Russia would lose all of her cities of over 100,000 and thus would suffer a "destruction of her society" from which she would not be able to recover.

It is clear, however, that in time Russia must reach the point where her "residual striking capacity" would be large enough to demolish all of America's sizeable cities and at that point Russia will have achieved "parity of saturation." Moreover, there is reason to believe that such parity of saturation is now at most a few years away, if that much.

Whatever balance saturation parity may establish will be a very precarious balance, yet we could perhaps live with it if there were universally accepted principles of international justice to which a reasoned appeal could be directed. In the absence of such principles, however, any one of a number of unresolved political conflicts could lead to a war between America and Russia.

There appears to be a tacit understanding between America and Russia on spheres of influence in Europe and—barring local incidents, or an uprising in East Germany—it appears unlikely that a conflict centered on Europe would lead to war between them. No such tacit understanding exists, however, outside of Europe, and a conflict centered on the Far East, Southeast Asia, or Latin America might lead to a war, even though neither Russia nor America wants such a war.

Since the end of the last war, America's commitments in the Far East and Southeast Asia have been steadily growing. None of the issues that have arisen there are

likely to be resolved in the predictable future and new issues may be expected to arise from time to time.

America's policies in these areas are not motivated by either economic or military considerations, rather they are motivated by political considerations and these, at times, reflect the prevailing domestic pressures. The American government knows very well, for instance, that the continued occupation of the off-shore islands of Quemoy and Matsu by the Nationalist Chinese forces ought to be terminated, and John F. Kennedy said as much before he was elected President, but because of the prevailing political pressures nothing was done about these islands after he was elected. President Johnson will have to operate under the same pressures.

After the war, many Americans came to believe that the fate of the world may depend on the outcome of a world struggle that will be waged between China, Russia, and their satellites on the one side and America as well as the rest of the nations—a few misguided neutrals excepted—on the other side. America's foreign policy in the Far East and Southeast Asia, charted in the early postwar years, is based on this premise.

Oddly enough, if this premise were correct, then America's proliferating involvements in these areas would be likely to trigger a world war before long. And only because it is becoming increasingly clear—as illustrated by the recent Russian-Chinese rift—that the premise is incorrect, can we assume that America could pursue her current policy for a while without getting herself and the rest of the world into very serious trouble.

Regarding Latin America, the official American position is that the United States cannot coexist with any Communist country in this hemisphere which looks for support to the Soviet Union, and because this position has strong popular support in America, it is likely to endure.

At the time of the Cuban crisis, in October 1962, it was widely believed that America had to risk war, because the transporting of a number of medium-range rockets to Cuba would have upset the strategic balance.

In fact, transporting these rockets to Cuba would have done nothing of the sort. There was no strategic balance at the time of the Cuban crisis and there is none today. Russia was proceeding then, as she is proceeding now, with increasing her residual striking capacity and she made a minor, rather than a major, step in this direction when she placed medium-range rockets on Cuba, which could be destroyed by a sudden strategic strike.

America was impelled to risk war in the Cuban crisis by political considerations, and not by any considerations of military strategy. Had Russia not yielded and had her ships continued their course to Cuba, in defiance of America's proclamation of the partial naval blockade of that island, American warships would have sunk Russian ships. No one can say how far escalation

would have gone and whether Russia, being unable to resist America in the Caribbean area, would have retaliated elsewhere, perhaps in Europe.

America risked war in the Cuban crisis and on this particular occasion Russia yielded. It would be unreasonable to expect that in the years to come Russia will yield always.

● FRANCE

Had the Cuban crisis led to a shooting war, it could have easily involved France also.

Let us consider first the unlikely case of a war between America and Russia, arising out of a conflict centered outside of Europe, which starts with a direct nuclear exchange between them. Such a war would be presumably of short duration and thus, while it might automatically involve the nations of Western Europe who remained an integral part of the American defense system, it would not be likely to involve nations in Western Europe who are not part of this system. Therefore, by disentangling herself from this defense system, France could presumably avoid being directly involved.

But if a Cuban type conflict were to lead to protracted hostilities between America and Russia, which stopped short of an atomic war, Russia might retaliate against one of America's close political allies in Western Europe, whether or not they are an integral part of the American defense system. In order to make reasonably sure, however, that Russia would not retaliate against her, France would have to make it clear, well ahead of time, that she does not interpret the controversies centered outside of Europe in terms of a world struggle which would automatically align the so-called "free nations" on the one side and the Soviet Union, as well as China, on the other.

General De Gaulle recently took a long step in this direction when he offered the good offices of France to help accomplish the reunion of North and South Vietnam. By speaking up on Vietnam, he went out of his way to make it clear that France does not recognize America as "the leader of the free world" in the current conflicts centered on Southeast Asia.

It would appear that General De Gaulle is in no need of advice from me in matters of foreign policy. He might not be in need of advice from me in matters of military strategy either. I am less sure of this, however, because military strategy is an area where technical knowledge and a dispassionate appraisal of the technological advances which may be expected might come in handy.

I do not think that France could have an independent strategic atomic striking force, which she could use to threaten a strike against Russia in a conflict in which major French interests might be at stake but not the very existence of France as a nation.

Still, before long, France could perhaps have a small striking force, consisting of submarines carrying long-range rockets, which could not be destroyed by Russia

in a sudden attack, and which could demolish in a counterblow, say, three Russian cities. Such a strategic striking force might be compared with the sting of the bee, which is not, properly speaking, an instrument of defense, for when it uses its sting, the bee dies. Yet, the sting of the bee deters people from going around catching bees, as long as they do not have any compelling reasons for doing so. If France ceased to be an integral part of the American defense system, and if she embraced the philosophy of "neutrality" in conflicts centered outside of Europe, then the Soviet Union would presumably have no reason to mount an attack against France and therefore such a small retaliatory capacity might be an adequate deterrent.

As long as France's strategic striking force consists of bombers, which would have to take off from air bases that could be destroyed by a Russian surprise attack, France is not in the possession even of "the sting of the bee." There is at the present time, however, no direct threat to the security of France; by the time there may arise in Europe, as indeed it might, a new threat to her security, France, with a little luck, could be in possession of a small, but invulnerable, striking force.

Two nations, like France and England, could pool their resources and jointly develop submarines, rockets, and bombs for the purpose of equipping themselves with a small strategic striking force. If, however, they were to place their striking forces under joint control—with both of them having power of veto—then these forces could not fulfill the function of the sting of the bee.

It is probably true that if France had such a sting of the bee and never tried to use it for anything, except for threatening retaliation in case of an atomic attack directed against her own territory, then it would do no harm for France to possess such a "sting" and it could conceivably do some good. I am not in a position to say whether the statesmen of France understand at this time that a strategic striking force must not be used for any other purpose.

Having discussed what France might gain by becoming semineutral, it is also necessary to consider now what France might lose by doing so.

Immediately after the second world war the security of France was threatened by a combination of communist pressure from the inside and the possibility of Russian military intervention from the outside. At that time many people believed, rightly or wrongly, that only America's possession of the atomic bomb saved France from falling under the domination of the Soviet Union.

There is no such internal threat to the security of France today, and were the Soviet Union to invade Western Europe, she would find herself at war with the United States, whether or not Nato is retained, whether or not France is semineutral, and whether or not America remains committed to the defense of Western Europe in any formal sense.

To my mind, the possibility that Russia might deliberately set out to invade Western Europe does not represent a real danger to France today. But a border incident in Europe, or an uprising in East Germany, might lead to a war that neither Russia nor America want, and if it did—with Nato as it is presently constituted—the war might escalate to the point where France might be destroyed, along with the rest of Western Europe, in the process of being “defended.”

If a war broke out in Europe, at some point during the seesaw of fighting, the Russians might be tempted to send their troops in hot pursuit across the prewar boundary and they might penetrate deep into Western territory or, conversely, certain Nato units might penetrate deep into Eastern territory. Clearly, the losing side would find it difficult to resist the temptation of resorting to the use of tactical atomic bombs against troops in combat, and once atomic bombs were dropped by either party on the other side of the prewar boundary, there would remain no clear conceptual line at which further escalation could be halted.

Today Russia and America find themselves in the same predicament in this regard and conceivably they could discuss with each other the limitations that they would have to impose upon themselves in Europe, concerning the conduct of such a war, in general, and concerning the use of tactical atomic weapons against troops in combat, in particular. No such discussions have taken place so far, however, and there are none in sight.

One may therefore ask whether, from the point of view of the safety of France, Nato—as presently constituted—would not represent a potential liability rather than a potential asset in the next decade.

● GERMANY

How is saturation parity likely to affect West Germany?

Let us ask ourselves, for example, what would have happened if there had occurred, a few years ago, a major uprising in East Germany against the established government and if substantial units of armed West German volunteers had moved into East Germany to assist the insurgents.

Presumably, at first, one would not have known with certainty whether these volunteers were acting with the tacit approval and active participation of the West German government, or whether they were acting against its wishes and in disregard of its orders. Had such a contingency occurred a few years ago, the odds are that America would have extended protection to West Germany against the strategic striking forces of Russia, on the ground that America must prevent the destruction of West German military power. America would have been likely to extend such protection to West Germany whether Germany was or was not the aggressor, and if there had been any doubt on that score, Germany would have been given the benefit of the doubt.

If a contingency of this sort were to occur in the years to come, and if the Russians were to fear that the clash might escalate into an all-out atomic war, they might decide to knock West Germany out of the war by dropping all at once between five and ten hydrogen bombs on West German cities. Having done this, Russia would then be in the position to speak to America as follows:

“German aggression forced us to do what we did, lest the clash of arms escalate into an all-out atomic war, which neither Russia nor America wants. We realize that America could now respond by demolishing one Russian city after another, but for every Russian city that America may demolish Russia would demolish one American city. Let’s be rational about this. What has happened, has happened; let’s see now where we go from here. Russia does not intend to occupy any West German territory and she is willing to put up a few per cent of her industrial output to help rebuild the cities of West Germany, provided her contribution is matched, dollar-for-dollar, by America.”

The Russians would hardly assume that the Americans would respond in a rational fashion if they were to drop bombs on American cities, but, in the contingency described above, they might, rightly or wrongly, expect a rational response if they were to demolish German cities and were to refrain from extending their attack to America’s own territory.

Would Germany need to have an atomic strategic striking force in order to safeguard her security in saturation parity?

In 1931, I met with a group of friends in Berlin who thought that the time had come for Germany to rearm in order to be more secure. I said to them that when Germany lost the war in 1918, her neighbors took from her all that they wanted and none of them wanted to take from Germany anything thereafter. I said that Germany did not possess anything that had to be defended by force of arms and thus, even though disarmed, she was quite secure; Germany would have to rearm only if she wanted to recover by force some of the territories she had lost in the first world war.

My German friends assured me—and I believe they were sincere—that they were not thinking of recovering any of the territories lost; they just wanted to have as much security for Germany as possible. At first, they appeared to have some difficulty in grasping my argument, perhaps because of its very simplicity. After a while, however, they seemed to get the point, or so I thought, until a few days later I met with them again and they started to argue the issue from scratch, from precisely the same point as before.

Evidently, they wanted Germany to rearm, even though they did not know why they wanted this; people who know what they want to do, but do not know why they want to do it, are rarely open to argument.

I could argue today that Germany does not need to acquire an atomic strategic striking force, just as I ar-

gued in 1931 that Germany did not need to rearm, but to many Germans my argument might not sound any more convincing today than it did some thirty years ago. It is a foregone conclusion that there will be people in Germany who would want Germany to have such a strategic striking force and the only question is whether they are going to prevail.

There are those in America who believe that Germany can be kept from wanting a striking force under her own control by setting up a strategic striking force under the joint control of America and Germany, with perhaps a few other nations joining in. The multilateral strategic striking force under discussion would be equipped with two hundred Polaris missiles, enough to demolish two hundred Russian cities if each of them were to reach its target. Such a striking force would be substantial. It would, however, not give the Germans what they want as long as America can veto its use, and there is reason to believe that the Germans propose to participate in it only because they assume that it may be possible for them to get rid of the veto.

The creation of such a striking force would make it possible subsequently to endow West Germany, by the mere stroke of a pen, with a substantial atomic striking force of her own, and few nations in Europe contemplate this possibility with equanimity.

In these circumstances one may ask whether it might not be preferable somehow to provide Germany with a small striking force, just large enough to enable her to deter, on her own, an unprovoked Russian attack against her cities.

If Germany were to set out to independently develop submarines, bombs, and rockets for the purpose of acquiring a "sting of the bee," the other nations would have little assurance that she would actually stop at having a *small* striking force. But if France and England were jointly to develop submarines, bombs, and rockets in order to equip themselves, each, with a small invulnerable striking force, perhaps there would not be too much objection raised, were they to give Germany a small striking force, just enough to let her have the sting of the bee also.

● ENGLAND

It is rather difficult to see current events in their historical perspective and it may be true that it is easier to see clearly the future than the present. In 1949, when the Russians exploded their first atomic bombs, I tried to look into the future and in an article printed in the *New Republic* in October of that year, I predicted that France would want to move toward a position of neutrality when Russia achieves parity of saturation. I was not prepared, however, to make a similar prediction for England and I wrote instead:

England may be different. England is no less vulnerable to bombs than the rest of Western Europe. But, after the fall of France, England de-

cidied to fight on in the face of the heaviest odds, and she emerged victorious. England might decide to hold out indefinitely as our ally and, with worse luck this time, perhaps suffer utter destruction in case of war.

Whether England is going to remain a close ally of the United States and an integral part of the American defense system, or whether she will adopt a position of semineutrality may well determine the shape of Europe in the years to come.

If England were to adopt a foreign policy and a military strategy somewhat similar to those of France, then French objections to England's becoming integrated with the rest of Western Europe would presumably disappear. Should England subsequently decide to enter the Common Market, in spite of the temporary economic disadvantages that this might entail, French and English economic power and political influence might balance those of Germany in Europe. If, however, England were to retain her special relationship with the United States, France might continue to resist the integration of England with the rest of Western Europe and Germany would then be likely to become the dominating influence in Europe.

If England were to adopt a policy of "semineutrality" she would presumably want to maintain a small strategic striking force that could function as the "sting of the bee." In fact, it might be politically very difficult or impossible for England to move toward a position of semineutrality if she did not keep up an independent and invulnerable striking force.

England is not likely to set up a strategic striking force large enough to come anywhere near saturation parity with the striking forces of Russia, and even if she did, she could not make use of such a striking force for anything except as a threat of retaliation in case of an atomic attack directed against her own territory. The threat of waging a massive atomic strike against Russia would be tantamount to a threat of murder and suicide, and such a threat would not be believable in any conflict with Russia in which major English interests might be at stake but not England's existence as a nation.

In these circumstances, one must ask whether England could stand up to Russia if she adopted a policy of semineutrality whether or not she were to maintain an independent strategic striking force.

One might ask, for instance, what would happen if England were neutral and Russia were to invade the Middle East and cut off Western Europe from Middle Eastern oil. I personally doubt that Russia would make such a move in order to force Western Europe to buy Russian oil at higher prices, or for any other reason that comes to mind, and moreover, if Russia were to make such a move, she would be likely to find herself at war with the United States, whether or not England is neutral.

To me, it seems rather unlikely that Russia could

make any military move against a neutral England that would affect a major English interest without getting herself into a war with America and it seems much more likely that, if England were to remain a close ally of America, a Russian-American conflict centered outside of Europe would involve her in a war with Russia.

There was a time when England had numerous political, economic, and military interests all over the world, and had to take risks in order to defend them. England could, and perhaps she should, reduce the risks that she is taking to the level of the interests that have remained.

It is being argued on the other side, that if England were to cease to be an ally of America, she would no longer have the kind of restraining influence on American policy that she exerted during the Korean War and again when France lost the war in Indochina. This argument may be correct, as far as it goes. But in a war, if there were an early exchange of strategic strikes between America and Russia, England as a military ally would be of little value to America, and if the war were protracted, she would be a burden to America, because America would have to protect her as best she can against retaliations by Russia. In saturation parity, England as a military ally would be a potential liability rather than a potential asset to America and therefore she could hardly continue to exert a restraining influence on American policy of the kind she exerted in the past.

It would be probably still true, that were England to

remain a close political ally of America then, in a contingency similar to the Cuban crisis, America would be restrained by the fear that Russia might in some way retaliate against England. It is questionable, however, whether England would want to exert a restraining influence on such a basis, and at such a price.

In summary, I believe that England would be more secure in the years to come if she were to adopt a position of semineutrality and were to maintain a small but independent striking force, just enough to function as the sting of the bee. By pooling their resources England and France could jointly develop submarines, rockets, and bombs and equip themselves each with a small but invulnerable striking force. Neither France nor England could use such a striking force for anything except for threatening a counterblow in case of an atomic attack extended to her own territory. If this were clearly understood and kept in mind, the possession of a small striking force by France and England would do no harm and it might do some good.

Barbara Tuchman, in her recent book, *The Guns of August*, relates the events of the first month of the first world war, and she forcefully demonstrates that all the great powers—England, as well as France and Germany—had based their strategies on the wrong premises. Perhaps it is too much to hope that the decision with which England is now faced may be arrived at on a different basis, but it would be a major tragedy if it were not.

GALEN E. JONES

The Living Economy of the Sea

An area of nature's realm that has received relatively little scientific attention is the sea, which covers over 70 per cent of the surface of this planet. Yet the oceans have held a matchless fascination for the minds and hearts of some men. For less than 100 years the oceans have been studied in a systematic way by a few dedicated oceanographers whose ranks have been swelling, particularly since World War II. It is now believed that the sea may be the unique phenomenon characterizing this planet, that life originated in the sea, that understanding the evolution and interrelations of life in the sea may unlock a fabulous wealth of food and mineral resources. To promote a greater understanding of these problems, last year the U.S. government outlined a program that would commit \$2.3 billion to the study of the sea over the next 10 years.

The oceans originated three to four billion years ago, one or two billion years after the formation of the planet earth itself. The most widely held concept concerning the origin of our solar system presumes the coalescing of massive, moving clouds of gas drifting

through space into a central nucleus of a hot ball of gas, the sun. In addition to this single nucleus, a group of satellite bodies attracted to the central nucleus and originating from the same gas cloud that gave birth to the sun rotated around the sun much as electrons move about the nucleus of an atom. These electrons became the planets of the sun and the earth was born as one of them.

The planet earth contracted but never reached the high temperatures of the sun. The sea still did not exist but water vapor was trapped in the interior magma and rock. As the temperature of the earth's surface dropped below the boiling point of water, water vapor spewed forth from the belly of the infant earth into great cloud masses. This steam condensed, fell, was converted to steam again until the earth became cool enough to permit the collection of rain water in its basins. Thus, the primeval ocean was created over many thousands of years as a great body of fresh water. In the millions and millions of years since this first water started to accumulate on the surface of the earth, water vapor has con-

tinued to pass through volcanoes and fumaroles to contribute to the moisture of the atmosphere and the seas. Today, the sea contains 330 million cubic miles of water (18 times the area of land above sea level).

The properties of water have probably provided the greatest advantages to this planet. The temperature of the earth is moderated by the stabilizing properties of water, especially its high specific heat, its high heat of vaporization, and its high heat of fusion. The surface temperatures of the earth are held near or between the very narrow range within which water remains a liquid, 0° to 100° centigrade. Most of the matter in the universe is either frozen or a blazing flame.

The sea acts as a massive reservoir of heat, tempering the cold of winter and cooling the high temperatures of summer. Ice formation is unique in that water expands by 9 per cent when it freezes. Thus, ice floats on water and is exposed to the sun's rays, preventing the oceans from freezing solid, limiting the spread of ice, and permitting the formation of great ocean currents which aid in moderating the temperature.

Living cells must be supplied with foods and oxygen in aqueous solution. A cell anywhere, therefore, must always be in contact with water. Over 70 per cent of living protoplasm is composed of water. When water is lost from protoplasm, life is suspended or lost. It is not surprising that life itself is believed to have originated in the sea.

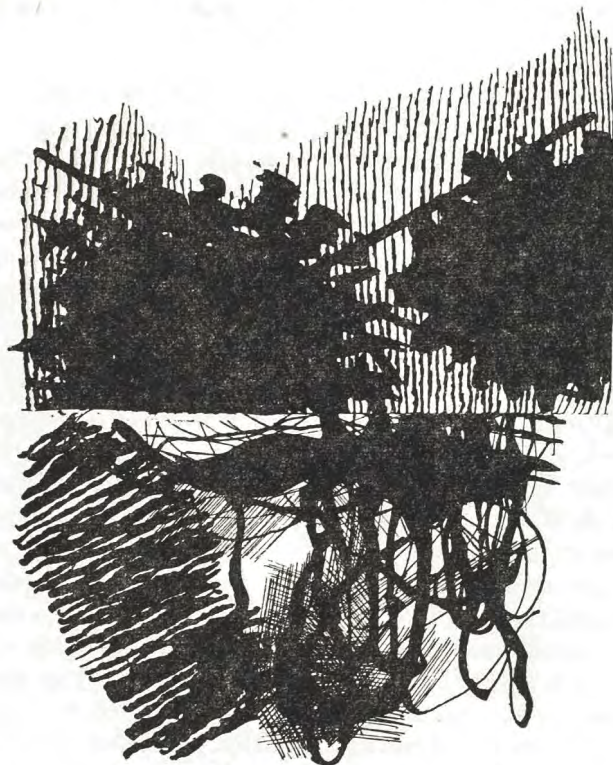
● DISSOLVED MINERALS

Water is the most effective solvent on earth, meaning it dissolves more substances than any other liquid. As a result, the seas have gradually become more and more

salty. The salinity of seawater today is about 3.5 per cent. One cubic mile of seawater contains 166 million tons of salt, 139 million tons of which is sodium chloride. Six other major ions, magnesium, calcium, potassium, sulfate, carbonate, and bromide, together with common salt, constitute over 99 per cent of the chemical species dissolved in seawater.

Commercial possibilities for utilizing these dissolved minerals of the ocean seem obvious but they are not without problems. Common salt has been recovered by evaporation of seawater for thousands of years by many cultures, but the relative amount required from the ocean is slight. In fact, one of the great problems in mining seawater is to determine what to do with the overabundance of sodium chloride. Magnesium has been supplied to the nation since 1941 by the Dow Chemical Company from seawater, and the Ethyl Corporation has been successfully recovering bromine from the sea since 1924. Many other valuable minerals are present in seawater as totally less than 1 per cent of the dissolved substances. One of the main reasons that elements like phosphorus, iron, copper, manganese, cobalt, and nickel are present in such small amounts in a soluble form is that they are concentrated from seawater by living creatures. Tunicates concentrate vanadium in their bodies by more than a factor of 100,000 over the concentration of vanadium in seawater. Oysters concentrate zinc and cobalt by a factor of more than 10,000. Thus, the remains of some of these marine creatures could be sources of valuable minerals. Oceanographers have long been aware that the sea bottom contains ore deposits comparable with those on land. Marine oozes and clays are rich in aluminum. A particularly promising accumulation of mineral resources is a cobblestone-like formation of iron-manganese nodules covering vast areas of the ocean floor. Even though these dark lumps of manganese oxide and iron hydroxide have been known since the eighteen-seventies, when the famous British *H.M.S. Challenger* expedition dredged them up from the bottom, no one really knows how they were formed.

In my laboratory, we are working on a solution to this problem. We know that the iron-manganese nodules usually contain less than 1 per cent copper, cobalt, and nickel but significant amounts of these elements on a tonnage basis. We know that the nodules are formed, concentrically, at a rate of 0.01 mm.–10 mm. per thousand years, often starting on an inert surface such as a shark's tooth or a whale's earbone. The growth rate is not necessarily even. They usually are formed in water deeper than 500 meters where the temperature of the water is — 1° to 2° C. Our hypothesis on their origin is that tiny marine bacteria are attracted to an inert surface and start scavenging very dilute organic matter which is swept by in the seawater. This organic matter often contains iron and manganese organometallic compounds. When the marine bacteria come in contact with the organometallic compounds, they consume the or-



The 'Sting of the Bee' in Saturation Parity

By

Leo Szilard

Introduction

When America and Russia will be in the position to destroy each other to any desired degree by an exchange of ~~strategic atomic~~ strikes, the nations of Western Europe will face a situation for which ~~there~~ is no precedent in history. On this occasion I do not propose to discuss the larger issues which will confront the world when nations can destroy each other ~~to any desired degree,~~ in a rapid exchange of strategic strikes, rather, I propose to examine here only what France, Germany and England, ~~in particular,~~ may do in order to safeguard their own security.

If a conflict between Russia and America had led to an armed clash a few years ago, and if at some point along the line of escalation, Russia had made a sudden attack against America's strategic air bases and rocket bases, then America's residual striking capacity would have been sufficient to demolish, in a counterblow, all of Russia's sizeable cities. If, conversely, America had made such an attack against Russia's air bases and rocket bases of known location, Russia's residual counterblow ~~would have fallen far short of demolishing~~ ^{could not have caused any comparable} ~~destruction.~~ ~~all of America's sizeable cities./~~

Today, America's strategic atomic striking forces might still be superior to those of Russia, by a factor of perhaps between three and ten, in the number of hydrogen bombs that they could deliver and, presumably, America could maintain this kind of numerical superiority in the years to come. She could not however, by doing so, keep Russia from steadily increasing her residual striking capacity. In recent years, Russia has steadily proceeded with the hardening of her rocket-

launching sites and the building of additional submarines, capable of launching long-range rockets, and to-day she has reached a point where her residual counterblow would be sufficient to demolish America's twelve largest cities, totaling over 25,000,000 inhabitants. This is a higher price than America would be willing to pay for reaching her political objectives, in any of the conflicts that might be expected to occur in the predictable future. In other words, Russia's "residual striking capacity" would be sufficient to-day to inflict "unacceptable damage" on America.

It is conceivable that America's striking forces ~~are~~ ^{might be} still/ superior to those of Russia in the sense that if it came to an all-out atomic war to-day, ~~while~~ America would lose all her major cities on the Eastern Seaboard and some of her cities in the West, ^{but} she could still recover from such a war, whereas Russia would lose all of her cities of over 100,000 and thus would suffer a "destruction of her society" from which she ^{would} ~~might~~ not be able to recover.

It is clear, however, that in time Russia must reach the point where her "residual striking capacity" would be large enough to demolish all of America's sizeable cities and at that point Russia will have achieved "parity of saturation." Moreover, there is reason to believe that such parity of saturation is now at most a few years away, if that much.

* * *

Whatever balance saturation parity may establish, ^{will be very} ~~it/ is/ a/ pre-~~ carious balance, ^{could perhaps} ~~yet, we might/ be/ able/ to/~~ live with it if there were universally accepted principles of international justice to which a reasoned appeal could be directed. In the absence of such principles, however, any one of a number of unresolved political conflicts could

lead to a war between America and Russia.

There appears to be a tacit understanding between America and Russia on spheres of influence in Europe and - barring local incidents, or an uprising in Eastern Germany - it appears unlikely that a conflict centered on Europe would lead to war between them. No such tacit understanding exists, however, outside of Europe and a conflict centered on the Far East, Southeast Asia or Latin America might lead to a war, even though neither Russia nor America want such a war.

Since the end of the last war, America's commitments in the Far East and Southeast Asia have been steadily growing. None of the issues, that have arisen there, are likely to be resolved in the predictable future and new issues ^{may be expected} ~~/a/t/e/ /l/t/k/e/l/y/~~ to arise from time to time.

America's policies in these areas are not motivated by either economic or military considerations, rather they are motivated by political considerations and these, at times, reflect the prevailing domestic pressures. The American Government knows very well, for instance, that the continued occupation of the off-shore islands of Quemoi and Matsu by the Nationalist Chinese forces ought to be terminated, and John F. Kennedy said as much before he was elected President, but because of the prevailing political pressures nothing was done about these islands after he was elected. President Johnson will have to operate under the same pressures.

After the war, many Americans came to believe that the fate of the world may depend on the outcome of a world struggle, that will be waged between China, Russia and their satellites on the one side and America as well as the rest of the nations - a few misguided neutrals excepted - on the other side. America's foreign policy in

the Far East and Southeast Asia, charted in the early postwar years, is based on this premise.

Oddly enough, if this premise were correct then America's proliferating involvements in these areas would be likely to trigger a world war before long. And only because it is becoming increasingly clear - as illustrated by the recent Russian-Chinese rift - that the premise is incorrect, can we assume that America could pursue her current policy, for a while, without getting herself, and the rest of the world, into very serious trouble.

* * *

Regarding Latin America, the official American position is that the United States cannot co-exist with any communist country in this hemisphere, which looks for support to the Soviet Union, and, because this position has strong popular support in America, it is likely to endure.

At the time of the Cuban crisis, in October of 1962, it was widely believed that America had to risk war, because the transporting of a number of medium-range rockets to Cuba, would have upset the strategic balance.

In fact, transporting these rockets to Cuba would have done nothing of the sort. There was no strategic balance at the time of the Cuban crisis and there is none to-day. Russia was proceeding then, as she is proceeding now, with increasing her residual striking capacity and she made a minor, rather than a major, step in this direction when she placed medium-range rockets on Cuba, which could be destroyed by a sudden strategic strike.

America was impelled to risk war in the Cuban crisis by political considerations, and not by any considerations of military strategy. Had Russia not yielded and had her ships continued their course on Cuba, in defiance of America's proclamation of the partial naval blockade of that island, American warships would have sunk Russian ships. No one can say how far escalation would have gone and whether Russia, being unable to resist America in the Caribbean area, would have retaliated elsewhere, perhaps in Europe.

America risked war in the Cuban crisis and on this particular occasion Russia yielded. It would be unreasonable to expect that in the years to come, Russia will yield always.

* * *

France

Had the Cuban crisis led to a shooting war, it could have easily involved France also.

Let us consider first the unlikely case ~~that~~^{of} a war between America and Russia, arising out of a conflict centered outside of Europe, ~~which~~^{which} ~~starts~~^{starts} with a direct nuclear exchange between them. Such a war would be presumably of short duration and thus, while it might automatically involve the nations of Western Europe who remained an integral part of the American defense system, it would not be likely to involve nations in ~~Western~~ Europe who are not part of this system. Therefore, by disentangling herself from this defense system, France could presumably avoid being directly involved.

But if a Cuban type conflict were to lead to protracted hostilities between America and Russia, which stops short of an atomic war, Russia might retaliate against one of America's close political allies in Western Europe, whether or not they are an integral part of the American defense system. ~~France~~^{In order to} ~~could~~^{make} reasonably sure, however,

France would have to make that Russia would not retaliate against her, ~~by making~~ it clear, well ahead of time, that she does not interpret the controversies centered outside of Europe in terms of a world struggle which would automatically align the so-called "free nations" on the one side and the Soviet Union, as well as China, on the other.

General de Gaulle : ecently took a long step in this direction when he offered the good offices of France to help accomplish the reunion of North V_ietnam and South Vietnam. By speaking up on Vietnam, he went out of his way to make it clear that France does not recognize America as "the leader of the free world" in the current conflicts centered on South Asia.

It would appear that General de Gaulle is in no need to take advice from me in matters of foreign policy. He might not be in need to take advice from me in matters of military strategy either. I am less sure of this, however, because military strategy is an area where technical knowledge, and a dispassionate appraisal of the technological advances which may be expected, might come in handy.

I do not think that France could have an independent strategic atomic striking force which she could use to threaten a strike against Russia, in a conflict in which major French interests might be at stake, but not the very existence of France as a nation.

Still, before long, France could perhaps have a small striking force, consisting of submarines carrying long-range rockets, which could not be destroyed by Russia in a sudden attack, and which could demolish in a counterblow, say, three Russian cities. Such a strategic striking force might be compared with the sting of the bee, which is not, properly speaking, an instrument of defense, for when it uses its sting, the bee dies. Yet, the sting of the bee deters people from going

around catching bees, as long as they don't have any compelling reasons for doing so. If France ceased to be an integral part of the American defense system, and if she embraced the philosophy of "neutrality" in conflicts centered outside of Europe, then the Soviet Union would presumably have no reason to mount an attack against France and therefore such a small retaliatory capacity might be an adequate deterrent.

As long as France's strategic striking force consists of bombers, which would have to take off from air bases that could be destroyed by a Russian surprise attack, France is not in the possession even of "the sting of the bee." There is at the present time, however, no direct threat to the security of France, and by the time there may arise in Europe, as indeed it might, a new threat to her security, France, with a little luck, could be in the possession of a small, but invulnerable, striking force.

Two nations, like France and England could pool their resources and jointly develop submarines, rockets and bombs for the purpose of equipping themselves with a small strategic striking force. If, however, they were to place their striking forces under joint control - with both of them having power of veto - then these forces could not fulfill the function of the sting of the bee.

It is probably true that if France had such a sting of the bee and never tried to use it for anything, except for threatening retaliation in case of an atomic attack directed against her own territory, then it would do no harm for France to possess such a "sting" and it would conceivably do some good. I am not in a position to say whether the statesmen of France understand at this time that a strategic striking force must not be used for any other purpose.

Having discussed what France might gain by becoming semi-neutral, it is also necessary to consider now what France might lose by doing so.

Right after the Second World War the security of France was threatened by the combination of communist pressure from the inside and the possibility of Russian military intervention from the outside. At that time many people believed, rightly or wrongly, that only America's possession of the atomic bomb saved France from falling under the domination of the Soviet Union.

There is no such internal threat to the security of France to-day, and were the Soviet Union to invade Western Europe she would find herself at war with the United States, whether or not NATO is retained, whether or not France is semi-neutral and whether or not America remains committed to the defense of Western Europe, in any formal sense.

To my mind, the possibility that Russia might deliberately set out to invade Western Europe does not represent a real danger to France to-day. But a border incident in Europe, or an uprising in East Germany, might lead to a war that neither Russia nor America want, and if it did - with NATO as it is presently constituted - the war might escalate to the point where France might be destroyed, along with the rest of Western Europe, in the process of being "defended."

If a war broke out in Europe, at some point during the see-saw of fighting, the Russians might be tempted to send their troops in hot pursuit across the pre-war boundary and they might penetrate deep into Western territory or, conversely certain NATO units might penetrate deep into Eastern territory. Clearly, the losing side would find it difficult to resist the temptation of resorting to the use of tactical atomic bombs against troops in combat, and once atomic bombs were

dropped, by either party on the other side of the pre-war boundary, there would remain no clear conceptual line at which further escalation could be halted.

To-day Russia and America find themselves in the same predicament in this regard and conceivably they could discuss with each other the limitations that they would have to impose upon themselves in Europe, concerning the conduct of such a war, in general, and concerning the use of tactical atomic weapons against troops in combat, in particular. No such discussions have taken place so far, however, and there are none in sight.

One may therefore ask whether, from the point of view of the safety of France, NATO - as presently constituted - would not represent a potential liability rather than a potential asset, in the next decade.

* * *

Germany

How is saturation parity likely to affect West Germany?

Let us ask ourselves, for example, what would have happened if there had occurred, a few years ago, a major uprising in East Germany against the established government and if substantial units of armed West German volunteers had moved into East Germany, to assist the insurgents.

Presumably, at first, one would not have known with certainty whether these volunteers were acting with the tacit approval, and active participation, of the West German Government, or whether they were acting against its wishes, and in disregard of its orders. Had such a contingency occurred a few years ago, the odds are that America would have extended protection to West Germany against the strategic striking forces of Russia, on the ground

that America must prevent the destruction of West German military power. America would have been likely to extend such protection to West Germany whether Germany was, or was not, the aggressor, and if there had been any doubt on that score, Germany would have been given the benefit of the doubt.

If a contingency of this sort were to occur in the years to come, and if the Russians were to fear that the clash might escalate into an all-out atomic war, they might decide to knock West Germany out of the war by dropping, all at once, between five and ten hydrogen bombs, on West German cities. Having done this, Russia would then be in the position to speak to America as follows:

"German aggression forced us to do what we did, lest the clash of arms escalate into an all-out atomic war, which neither Russia nor America want. We realize that America could now respond by demolishing one Russian city after another, but for every Russian city that America may demolish Russia would demolish one American city. Let's be rational about this. What has happened, has happened; let's see now where we go from here. Russia does not intend to occupy any West German territory and she is willing to put up a few percent of her industrial output to help rebuild the cities of West Germany, provided her contribution is matched, collar-for-dollar, by America."

The Russians would hardly ~~be so foolish~~ as to assume that the Americans would respond in a rational fashion if they were to drop bombs on American cities but, in the contingency described above, they might, rightly or wrongly, expect a rational response if they were to demolish German cities ~~and were to refrain from extending~~ their attack to America's own territory.

* * *

Would Germany need to have an atomic strategic striking force in order to safeguard her security in saturation parity?

In 1931, I met with a group of friends in Berlin who thought that the time had come for Germany to re-arm, in order to be more secure.

I said to them that when Germany lost the war in 1918, her neighbors took from her all that they **wanted** and none of them wanted to take from Germany anything thereafter. I said that Germany did not possess anything that had to be defended by force of arms and thus, even though disarmed, she was quite secure; Germany **would have** to re-arm only if she wanted to recover by force some of the territories she had lost in the First World War.

My German friends assured me - and I believe they were sincere - that they were not thinking of recovering any of the territories lost; they just wanted to have as much security for Germany as possible. At first, they appeared to have some difficulty in grasping my argument, perhaps because of its very simplicity. After a while, however, they seemed to get the point, or so I thought, until a few days later I met with them again and they started to argue the issue from scratch, from precisely the same point as before.

Evidently, they wanted Germany to re-arm, even though they did not know why they wanted this, and people who know what they want to do, but do not know why they want to do it, are rarely open to argument.

I could argue to-day that Germany does not need to acquire an atomic strategic striking force, just as I argued in 1931 that Germany did not need to re-arm, but to many Germans my argument might not sound any more convincing to-day that it did some thirty years ago. It is a foregone conclusion that there will be people in Germany who would want Germany to have such a strategic striking force and the only question is whether they are going to prevail.

There are those in America who believe that Germany can be kept from wanting to have a striking force under her own control, by setting up a strategic striking force under the joint control of America and

Germany, with perhaps a few other nations joining in. The multilateral strategic striking force under discussion would be equipped with two hundred Polaris missiles, enough to demolish two hundred Russian cities if each of them were to reach its target. Such a striking force would be substantial. It would, however, not give the Germans what they want, as long as America can veto its use, and there is reason to believe that the Germans propose to participate in it only because they assume that it may be possible for them to get rid of the veto.

The creation of such a striking force would make it possible subsequently to endow West Germany, by the mere stroke of a pen, with a substantial atomic striking force of her own, and few nations in Europe contemplate this possibility with equanimity.

In these circumstances one may ask whether it might not be preferable somehow to provide Germany, with a small striking force, just large enough to enable her to deter, on her own, an unprovoked Russian attack against her cities.

If Germany were to set out to develop on her own submarines, bombs and rockets for the purpose of acquiring a "sting of the bee," the other nations would have little assurance that she would actually stop at having a small striking force. But if France and England were jointly
/to develop /j/ointl/y/ submarines, bombs and rockets, in order to equip themselves, each, with a small invulnerable striking force, ^{perhaps} ~~then~~ there would
~~might~~ not be too much objection raised, were they to give Germany a small striking force, just enough to let her have the sting of the bee also.

England

X It is rather difficult to see current events in their ~~historical~~ ^{historical} perspective and it may be true that it is easier to see clearly the

the future than the present. In 1949, when the Russians exploded their first atomic bombs, I tried to look into the future and in an article printed in the NEW REPUBLIC (U.S.A.) in October of that year, I predicted that France would want to move towards a position of neutrality, when Russia achieves parity of saturation. I was not prepared, however, to make a similar prediction for England and I wrote instead:

"England may be different. England is no less vulnerable to bombs than the rest of Western Europe. But, after the fall of France, England decided to fight on in the face of the heaviest odds, and she emerged victorious. England might decide to hold out indefinitely as our ally and, with worse luck this time, perhaps suffer utter destruction in case of war."

Whether England is going to remain a close ally of the United States and an integral part of the American defense system, or whether she will adopt a position of "semi-neutrality" may well determine the shape of Europe in the years to come.

If England were to adopt a foreign policy and a military strategy somewhat similar to those of France, then French objections to England's becoming integrated with the rest of Western Europe would presumably disappear. Should England subsequently decide to enter the Common Market, in spite of the temporary economic disadvantages that this might entail, French and English economic power and political influence might balance those of Germany in Europe. If, however, England were to retain her special relationship with the United States, France might continue to resist the integration of England with the rest of Western Europe and Germany would then be likely to become the dominating influence in Europe.

If England were to adopt a policy of "semi-neutrality" she would presumably want to maintain a small strategic striking force that could function as the "sting of the bee." In fact, it might be

politically very difficult, or impossible, for England to move towards a position of 'semi- neutrality' if she did not keep up an independent and invulnerable striking force.

England is not likely to set up a strategic striking force large enough to come anywhere near saturation parity with the striking forces of Russia, and even if she did she could not make use of such a striking force for anything, except for threatening retaliation in case of an atomic attack directed against her own territory. The threat of waging a massive atomic strike against Russia would be tantamount to a threat of murder and suicide and such a threat would not be believable in any conflict with Russia in which major English interests might be at stake, but not England's existence as a nation.

In these circumstances, one must ask whether England could stand up to Russia if she adopted a policy of semi-neutrality, whether or not she were to maintain an independent strategic striking force.

One might ask, for instance, what would happen if England were neutral and Russia were to invade the Middle-East and cut off Western Europe from Mid-Eastern oil. I personally doubt that Russia would make such a move in order to force Western Europe to buy Russian oil at higher prices, or for any other reason that comes to mind, and moreover, if Russia were to make such a move, she would be likely to find herself at war with the United States, whether or not England is neutral.

To me, it seems rather unlikely that Russia could make any military move against a neutral England that would affect a major English interest without getting herself into a war with America and it seems much more likely that, if England were to remain a close ally of America, a Russian-American conflict centered outside of Europe would involve her in a war with Russia.

There was a time when England had numerous political, economic

and military interests all over the world, and had to take risks in order to defend them. England could, and perhaps she should, reduce the risks that she is taking to the level of the interests that have remained.

It is being argued on the other side, that if England were to cease to be an ally of America, she would no longer have the kind of restraining influence on American policy that she exerted during the Korean War and again when France lost the war in Indochina. This argument may be correct, as far as it goes. But in a war, if ^{there} ~~it~~ ~~were~~ ~~an~~ ~~early~~ ~~exchange~~ of strategic strikes between America and Russia, England as a military ally would be of little value to America, and if the war were protracted, she would be a burden to America, because America would have to protect her as best she can against retaliations by Russia. In saturation parity, England as a military ally ^{would} ~~be~~ be a potential liability rather than a potential ^{to America} ~~asset~~ and therefore she could hardly continue to exert a restraining influence on American policy of the kind she exerted in the past.

It would be probably still true, that were England to remain a close political ally of America then, in a contingency similar to the Cuban crisis, America would be restrained by the fear that Russia might in some way retaliate against England. It is questionable, however, whether England would want to exert a restraining influence on such a basis, and at such a price.

To sum up:

I believe that England would be more secure in the years to come if she were to adopt a position of "semi-neutrality" and were to maintain a small, but independent, striking force, just enough to function as "the sting of the bee." By pooling their resources England and France could jointly develop submarines, rockets and bombs and equip themselves each with a small but invulnerable striking force. Neither France nor England could use such a

striking force for anything except for threatening a counterblow in case of an atomic attack extended to her own territory. If this were clearly understood and kept in mind, the possession of a small striking force by France and England would do no harm and it might do some good.

Barbara Tuchman, in her recent book The Guns of August relates the events of the first month of the First World War, and she forcefully demonstrates that all the great powers - England, as well as France and Germany - had based their strategies on the wrong premises. Perhaps it is too much to hope that the decision with which England is now faced may be arrived at on a different basis, but it would be a major tragedy if it were not.

* * *

Postscript

In the long run, the proliferation of atomic bombs may be inevitable, unless the United States and the Soviet Union reach an agreement on arms control, that is based on the concept of the "minimal deterrent," and puts an end to saturation parity.

Russia recently accepted the American notion that America, as well as Russia, may retain a small strategic striking force until the end of the third stage of the disarmament agreement and that inspection shall not be limited to equipment which is to be destroyed but shall be extended also to equipment which is being retained. There are, however, no conversations in progress between America and Russia which would elucidate whether they both mean the same thing when they appear to be in agreement on the concept of the "minimal deterrent" and it is not possible to say whether they would be prepared and able to conclude an agreement on arms control on the basis of this concept. Therefore, the odds are that saturation parity is going to prevail in the predictable future.

It may be asked whether England and the other nations of Western Europe would not render a disservice to America by moving towards neutrality in saturation parity. Among several things to consider in this regard, there is also this to be kept in mind:

Neither America nor Russia want war, but a conflict centered outside of Europe might lead to war. Neither America nor Russia would want such a war to escalate, but it might escalate and it might well escalate to the point where America would have to draw for its recovery on the resources of Western Europe.

Several years ago, before Russia was anywhere near saturation parity, it would have been a foregone conclusion that in case of an armed clash between American and Russian forces, at some point along the line the Russian would put an end to escalation. But if such a clash were to occur in the fully symmetrical situation of saturation parity, then one could not predict which of the two countries would take the first step to halt escalation. And, if it is no longer possible to say who will put an end to escalation, then also one cannot predict just how far escalation might go.

If it came to an exchange of strategic strikes between America and Russia, their destruction might well go far beyond that which Western Europe experienced during the last war. And if it hadn't been for the Marshall Plan, the postwar recovery which occurred in Western Europe would not have taken place.

If there is another war,
/ America's recovery ~~after the next war~~ might be brought about by a Marshall Plan in reverse, but only if the war were to leave the nations of Western Europe unscathed. Perhaps these nations, when they reach the point where they would formally proclaim their "neutrality" would pledge to devote a few percent of their industrial output to aid America, should she suffer major devastation in an exchange of strategic strikes

with Russia.

It may be asked whether in case of such a war a neutral Western Europe would not be too severely affected by radioactive fall-out to be able to render substantial economic assistance to America.

To-day, if Russia and America were to exchange strategic strikes, sufficient to demolish the twelve largest American cities (with a total of about 25 million inhabitants), and to cause a similar toll in Russia, the effect of fall-out on England and the rest of Western Europe would be negligible.

It is conceivable, however, that the arms race may enter into a new phase before long. Both America and Russia may be expected soon to deploy anti-missile missiles in defense of their rocket launching bases. For such a defense to be successful, it is only necessary that it prevent a ground burst of the incoming rocket and this is likely to be an attainable goal. But America and Russia might go further and deploy anti-missile missiles for the defense of their cities also. If this came to pass, America would almost certainly embark on a program of building fall-out shelters on a large scale for the population of her cities.

The building of fall-out shelters might not make very much sense for countries which may be expected to be a target of the attack, whether or not they deploy anti-missile missiles for the defense of their cities. For the neutral countries of Europe, however, such shelters would offer the kind of protection they would need if an arms race of this type were to get under way, and they could offer them adequate protection.

THE END

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By
Leo Szilard

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Introduction

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If a conflict between Russia and America had led to an armed clash a few years ago, and if at some point along the line of escalation, Russia had made a sudden attack against America's strategic air bases and rocket bases, then America's residual striking capacity would have been sufficient to demolish, in a counterblow, all of Russia's sizeable cities. If, conversely, America had made such an attack against Russia's air bases and rocket bases of known location, Russia's residual counterblow ~~would have fallen far short of demolishing all of America's sizeable cities~~, ~~could not have caused any comparable destruction.~~

Today, America's strategic atomic striking forces might still be superior to those of Russia, by a factor of perhaps between three and ten, in the number of hydrogen bombs that they could deliver and, presumably, America could maintain this kind of numerical superiority in the years to come. She could not however, by doing so, keep Russia from steadily increasing her residual striking capacity. In recent years, Russia has steadily proceeded with the hardening of her rocket-

launching sites and the building of additional submarines, capable of launching long-range rockets, and to-day she has reached a point where her residual counterblow would be sufficient to demolish America's twelve largest cities, totaling over 25,000,000 inhabitants. This is a higher price than America would be willing to pay for reaching her political objectives, in any of the conflicts that might be expected to occur in the predictable future. In other words, Russia's "residual striking capacity" would be sufficient to-day to inflict "unacceptable damage" on America.

It is conceivable that America's striking forces ~~are~~ ^{might be} still/ superior to those of Russia in the sense that if it came to an all-out atomic war to-day, ~~while~~ America would lose all her major cities on the Eastern Seaboard and some of her cities in the West, ^{but} she could still recover from such a war, whereas Russia would lose all of her cities of over 100,000 and thus would suffer a "destruction of her society" from which she ^{would} ~~might~~ not be able to recover.

It is clear, however, that in time Russia must reach the point where her "residual striking capacity" would be large enough to demolish all of America's sizeable cities and at that point Russia will have achieved "parity of saturation." Moreover, there is reason to believe that such parity of saturation is now at most a few years away, if that much.

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Whatever balance saturation parity may establish, ^{will be very} ~~it/ is/ a/ pre-~~ carious balance, ^{could perhaps} yet, we ~~might be able to~~ live with it if there were universally accepted principles of international justice to which a reasoned appeal could be directed. In the absence of such principles, however, any one of a number of unresolved political conflicts could

lead to a war between America and Russia.

There appears to be a tacit understanding between America and Russia on spheres of influence in Europe and - barring local incidents, or an uprising in Eastern Germany - it appears unlikely that a conflict centered on Europe would lead to war between them. No such tacit understanding exists, however, outside of Europe and a conflict centered on the Far East, Southeast Asia or Latin America might lead to a war, even though neither Russia nor America want such a war.

Since the end of the last war, America's commitments in the Far East and Southeast Asia have been steadily growing. None of the issues, that have arisen there, are likely to be resolved in the predictable future and new issues ^{may be expected} ~~/a/k/e/ /l/i/k/e/l/y/~~ to arise from time to time.

America's policies in these areas are not motivated by either economic or military considerations, rather they are motivated by political considerations and these, at times, reflect the prevailing domestic pressures. The American Government knows very well, for instance, that the continued occupation of the off-shore islands of Quemoi and Matsu by the Nationalist Chinese forces ought to be terminated, and John F. Kennedy said as much before he was elected President, but because of the prevailing political pressures nothing was done about these islands after he was elected. President Johnson will have to operate under the same pressures.

After the war, many Americans came to believe that the fate of the world may depend on the outcome of a world struggle, that will be waged between China, Russia and their satellites on the one side and America as well as the rest of the nations - a few misguided neutrals excepted - on the other side. America's foreign policy in

the Far East and Southeast Asia, charted in the early postwar years, is based on this premise.

Oddly enough, if this premise were correct then America's proliferating involvements in these areas would be likely to trigger a world war before long. And only because it is becoming increasingly clear - as illustrated by the recent Russian-Chinese rift - that the premise is incorrect, can we assume that America could pursue her current policy, for a while, without getting herself, and the rest of the world, into very serious trouble.

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Regarding Latin America, the official American position is that the United States cannot co-exist with any communist country in this hemisphere, which looks for support to the Soviet Union, and, because this position has strong popular support in America, it is likely to endure.

At the time of the Cuban crisis, in October of 1962, it was widely believed that America had to risk war, because the transporting of a number of medium-range rockets to Cuba, would have upset the strategic balance.

In fact, transporting these rockets to Cuba would have done nothing of the sort. There was no strategic balance at the time of the Cuban crisis and there is none to-day. Russia was proceeding then, as she is proceeding now, with increasing her residual striking capacity and she made a minor, rather than a major, step in this direction when she placed medium-range rockets on Cuba, which could be destroyed by a sudden strategic strike.

America was impelled to risk war in the Cuban crisis by political considerations, and not by any considerations of military strategy. Had Russia not yielded and had her ships continued their course on Cuba, in defiance of America's proclamation of the partial naval blockade of that island, American warships would have sunk Russian ships. No one can say how far escalation would have gone and whether Russia, being unable to resist America in the Caribbean area, would have retaliated elsewhere, perhaps in Europe.

America risked war in the Cuban crisis and on this particular occasion Russia yielded. It would be unreasonable to expect that in the years to come, Russia will yield always.

* * *

France

Had the Cuban crisis led to a shooting war, it could have easily involved France also.

Let us consider first the unlikely case ^{of} ~~that~~ a war between America and Russia, arising out of a conflict centered outside of Europe, ^{which} ~~which~~ ~~to~~ starts with a direct nuclear exchange between them. Such a war would be presumably of short duration and thus, while it might automatically involve the nations of Western Europe who remained an integral part of the American defense system, it would not be likely to involve nations in ~~Western~~ Europe who are not part of this system. Therefore, by disentangling herself from this defense system, France could presumably avoid being directly involved.

But if a Cuban type conflict were to lead to protracted hostilities between America and Russia, which stops short of an atomic war, Russia might retaliate against one of America's close political allies in Western Europe, whether or not they are an integral part of the American defense system. ^{In order to} ~~France/ could~~ make reasonably sure, however,

France would have to make that Russia would not retaliate against her, ~~by making~~ it clear, well ahead of time, that she does not interpret the controversies centered outside of Europe in terms of a world struggle which would automatically align the so-called "free nations" on the one side and the Soviet Union, as well as China, on the other.

General de Gaulle : ecently took a long step in this direction when he offered the good offices of France to help accomplish the reunion of North V_ietnam and South Vietnam. By speaking up on Vietnam, he went out of his way to make it clear that France does not recognize America as ["]the leader of the free world["] in the current conflicts centered on South Asia.

It would appear that General de Gaulle is in no need to take advice from me in matters of foreign policy. He might not be in need to take advice from me in matters of military strategy either. I am less sure of this, however, because military strategy is an area where technical knowledge, and a dispassionate appraisal of the technological advances which may be expected, might come in handy.

I do not think that France could have an independent strategic atomic striking force which she could use to threaten a strike against Russia, in a conflict in which major French interests might be at stake, but not the very existence of France as a nation.

Still, before long, France could perhaps have a small striking force, consisting of submarines carrying long-range rockets, which could not be destroyed by Russia in a sudden attack, and which could demolish in a counterblow, say, three Russian cities. Such a strategic striking force might be compared with the sting of the bee, which is not, properly speaking, an instrument of defense, for when it uses its sting, the bee dies. Yet, the sting of the bee deters people from going

around catching bees, as long as they don't have any compelling reasons for doing so. If France ceased to be an integral part of the American defense system, and if she embraced the philosophy of "neutrality" in conflicts centered outside of Europe, then the Soviet Union would presumably have no reason to mount an attack against France and therefore such a small retaliatory capacity might be an adequate deterrent.

As long as France's strategic striking force consists of bombers, which would have to take off from air bases that could be destroyed by a Russian surprise attack, France is not in the possession even of "the sting of the bee." There is at the present time, however, no direct threat to the security of France, and by the time there may arise in Europe, as indeed it might, a new threat to her security, France, with a little luck, could be in the possession of a small, but invulnerable, striking force.

Two nations, like France and England could pool their resources and jointly develop submarines, rockets and bombs for the purpose of equipping themselves with a small strategic striking force. If, however, they were to place their striking forces under joint control - with both of them having power of veto - then these forces could not fulfill the function of the sting of the bee.

It is probably true that if France had such a sting of the bee and never tried to use it for anything, except for threatening retaliation in case of an atomic attack directed against her own territory, then it would do no harm for France to possess such a "sting" and it would conceivably do some good. I am not in a position to say whether the statesmen of France understand at this time that a strategic striking force must not be used for any other purpose.

Having discussed what France might gain by becoming semi-neutral, it is also necessary to consider now what France might lose by doing so.

Right after the Second World War the security of France was threatened by the combination of communist pressure from the inside and the possibility of Russian military intervention from the outside. At that time many people believed, rightly or wrongly, that only America's possession of the atomic bomb saved France from falling under the domination of the Soviet Union.

There is no such internal threat to the security of France to-day, and were the Soviet Union to invade Western Europe she would find herself at war with the United States, whether or not NATO is retained, whether or not France is semi-neutral and whether or not America remains committed to the defense of Western Europe, in any formal sense.

To my mind, the possibility that Russia might deliberately set out to invade Western Europe does not represent a real danger to France to-day. But a border incident in Europe, or an uprising in East Germany, might lead to a war that neither Russia nor America want, and if it did - with NATO as it is presently constituted - the war might escalate to the point where France might be destroyed, along with the rest of Western Europe, in the process of being "defended."

If a war broke out in Europe, at some point during the see-saw of fighting, the Russians might be tempted to send their troops in hot pursuit across the pre-war boundary and they might penetrate deep into Western territory or, conversely certain NATO units might penetrate deep into Eastern territory. Clearly, the losing side would find it difficult to resist the temptation of resorting to the use of tactical atomic bombs against troops in combat, and once atomic bombs were

dropped, by either party on the other side of the pre-war boundary, there would remain no clear conceptual line at which further escalation could be halted.

To-day Russia and America find themselves in the same predicament in this regard and conceivably they could discuss with each other the limitations that they would have to impose upon themselves in Europe, concerning the conduct of such a war, in general, and concerning the use of tactical atomic weapons against troops in combat, in particular. No such discussions have taken place so far, however, and there are none in sight.

One may therefore ask whether, from the point of view of the safety of France, NATO - as presently constituted - would not represent a potential liability rather than a potential asset, in the next decade.

* * *

Germany

How is saturation parity likely to affect West Germany?

Let us ask ourselves, for example, what would have happened if there had occurred, a few years ago, a major uprising in East Germany against the established government and if substantial units of armed West German volunteers had moved into East Germany, to assist the insurgents.

Presumably, at first, one would not have known with certainty whether these volunteers were acting with the tacit approval, and active participation, of the West German Government, or whether they were acting against its wishes, and in disregard of its orders. Had such a contingency occurred a few years ago, the odds are that America would have extended protection to West Germany against the strategic striking forces of Russia, on the ground

that America must prevent the destruction of West German military power. America would have been likely to extend such protection to West Germany whether Germany was, or was not, the aggressor, and if there had been any doubt on that score, Germany would have been given the benefit of the doubt.

If a contingency of this sort were to occur in the years to come, and if the Russians were to fear that the clash might escalate into an all-out atomic war, they might decide to knock West Germany out of the war by dropping, all at once, between five and ten hydrogen bombs, on West German cities. Having done this, Russia would then be in the position to speak to America as follows:

"German aggression forced us to do what we did, lest the clash of arms escalate into an all-out atomic war, which neither Russia nor America want. We realize that America could now respond by demolishing one Russian city after another, but for every Russian city that America may demolish Russia would demolish one American city. Let's be rational about this. What has happened, has happened; let's see now where we go from here. Russia does not intend to occupy any West German territory and she is willing to put up a few percent of her industrial output to help rebuild the cities of West Germany, provided her contribution is matched, collar-for-dollar, by America."

The Russians would hardly ~~be so foolish~~ as to assume that the Americans would respond in a rational fashion if they were to drop bombs on American cities but, in the contingency described above, they might, rightly or wrongly, expect a rational response if they were to demolish German cities ^{and were to refrain from extending} ~~only and did not extend~~ their attack to America's own territory.

* * *

Would Germany need to have an atomic strategic striking force in order to safeguard her security in saturation parity?

In 1931, I met with a group of friends in Berlin who thought that the time had come for Germany to re-arm, in order to be more secure.

I said to them that when Germany lost the war in 1918, her neighbors took from her all that they **wanted** and none of them wanted to take from Germany anything thereafter. I said that Germany did not possess anything that had to be defended by force of arms and thus, even though disarmed, she was quite secure; Germany **would have** to re-arm only if she wanted to recover by force some of the territories she had lost in the First World War.

My German friends assured me - and I believe they were sincere - that they were not thinking of ~~re~~recovering any of the territories lost; they just wanted to have as much security for Germany as possible. At first, they appeared to have some difficulty in grasping my argument, perhaps because of its very simplicity. After a while, however, they seemed to get the point, or so I thought, until a few days later I met with them again and they started to argue the issue from scratch, from precisely the same point as before.

Evidently, they wanted Germany to re-arm, even though they did not know why they wanted this, and people who know what they want to do, but do not know why they want to do it, are rarely open to argument.

I could argue to-day that Germany does not need to acquire an atomic strategic striking force, just as I argued in 1931 that Germany did not need to re-arm, but to many Germans my argument might not sound any more convincing to-day that it did some thirty years ago. It is a foregone conclusion that there will be people in Germany who would want Germany to have such a strategic striking force and the only question is whether they are going to prevail.

There are those in America who believe that Germany can be kept from wanting to have a striking force under her own control, by setting up a strategic striking force under the joint control of America and

Germany, with perhaps a few other nations joining in. The multilateral strategic striking force under discussion would be equipped with two hundred Polaris missiles, enough to demolish two hundred Russian cities if each of them were to reach its target. Such a striking force would be substantial. It would, however, not give the Germans what they want, as long as America can veto its use, and there is reason to believe that the Germans propose to participate in it only because they assume that it may be possible for them to get rid of the veto.

The creation of such a striking force would make it possible subsequently to endow West Germany, by the mere stroke of a pen, with a substantial atomic striking force of her own, and few nations in Europe contemplate this possibility with equanimity.

In these circumstances one may ask whether it might not be preferable somehow to provide Germany, with a small striking force, just large enough to enable her to deter, on her own, an unprovoked Russian attack against her cities.

If Germany were to set out to develop on her own submarines, bombs and rockets for the purpose of acquiring a "sting of the bee," the other nations would have little assurance that she would actually stop at having a small striking force. But if France and England were jointly to develop ~~/j/d/i/t/t/1/y/~~ submarines, bombs and rockets, in order to equip themselves, each, with a small invulnerable striking force, ^{perhaps} ~~/t/h/e/r/~~ there would ~~/t/h/e/r/~~ not be too much objection raised, were they to give Germany a small striking force, just enough to let her have the sting of the bee also.

England

It is rather difficult to see current events in their historical perspective and it may be true that it is easier to see clearly the

the future than the present. In 1949, when the Russians exploded their first atomic bombs, I tried to look into the future and in an article printed in the NEW REPUBLIC (U.S.A.) in October of that year, I predicted that France would want to move towards a position of neutrality, when Russia achieves parity of saturation. I was not prepared, however, to make a similar prediction for England and I wrote instead:

"England may be different. England is no less vulnerable to bombs than the rest of Western Europe. But, after the fall of France, England decided to fight on in the face of the heaviest odds, and she emerged victorious. England might decide to hold out indefinitely as our ally and, with worse luck this time, perhaps suffer utter destruction in case of war."

Whether England is going to remain a close ally of the United States and an integral part of the American defense system, or whether she will adopt a position of "semi-neutrality" may well determine the shape of Europe in the years to come.

If England were to adopt a foreign policy and a military strategy somewhat similar to those of France, then French objections to England's becoming integrated with the rest of Western Europe would presumably disappear. Should England subsequently decide to enter the Common Market, in spite of the temporary economic disadvantages that this might entail, French and English economic power and political influence might balance those of Germany in Europe. If, however, England were to retain her special relationship with the United States, France might continue to resist the integration of England with the rest of Western Europe and Germany would then be likely to become the dominating influence in Europe.

If England were to adopt a policy of "semi-neutrality" she would presumably want to maintain a small strategic striking force that could function as the "sting of the bee." In fact, it might be

politically very difficult, or impossible, for England to move towards a position of 'semi- neutrality' if she did not keep up an independent and invulnerable striking force.

England is not likely to set up a strategic striking force large enough to come anywhere near saturation parity with the striking forces of Russia, and even if she did she could not make use of such a striking force for anything, except for threatening retaliation in case of an atomic attack directed against her own territory. The threat of waging a massive atomic strike against Russia would be tantamount to a threat of murder and suicide and such a threat would not be believable in any conflict with Russia in which major English interests might be at stake, but not England's existence as a nation.

In these circumstances, one must ask whether England could stand up to Russia if she adopted a policy of semi-neutrality, whether or not she were to maintain an independent strategic striking force.

One might ask, for instance, what would happen if England were neutral and Russia were to invade the Middle-East and cut off Western Europe from Mid-Eastern oil. I personally doubt that Russia would make such a move in order to force Western Europe to buy Russian oil at higher prices, or for any other reason that comes to mind, and moreover, if Russia were to make such a move, she would be likely to find herself at war with the United States, whether or not England is neutral.

To me, it seems rather unlikely that Russia could make any military move against a neutral England that would affect a major English interest without getting herself into a war with America and it seems much more likely that, if England were to remain a close ally of America, a Russian-American conflict centered outside of Europe would involve her in a war with Russia.

There was a time when England had numerous political, economic

and military interests all over the world, and had to take risks in order to defend them. England could, and perhaps she should, reduce the risks that she is taking to the level of the interests that have remained.

It is being argued on the other side, that if England were to cease to be an ally of America, she would no longer have the kind of restraining influence on American policy that she exerted during the Korean War and again when France lost the war in Indochina. This argument may be correct, as far as it goes. But in a war, if ^{there} ~~it~~ ~~were~~ ~~an~~ ~~early~~ ~~exchange~~ of strategic strikes between America and Russia, England as a military ally would be of little value to America, and if the war were protracted, she would be a burden to America, because America would have to protect her as best she can against retaliations by Russia. In saturation parity, England as a military ally ^{would} ~~be~~ be a potential liability rather than a potential ^{to America} ~~asset~~ and therefore she could hardly continue to exert a restraining influence on American policy of the kind she exerted in the past.

It would be probably still true, that were England to remain a close political ally of America then, in a contingency similar to the Cuban crisis, America would be restrained by the fear that Russia might in some way retaliate against England. It is questionable, however, whether England would want to exert a restraining influence on such a basis, and at such a price.

To sum up:

I believe that England would be more secure in the years to come if she were to adopt a position of "semi-neutrality" and were to maintain a small, but independent, striking force, just enough to function as "the sting of the bee." By pooling their resources England and France could jointly develop submarines, rockets and bombs and equip themselves each with a small but invulnerable striking force. Neither France nor England could use such a

striking force for anything except for threatening a counterblow in case of an atomic attack extended to her own territory. If this were clearly understood and kept in mind, the possession of a small striking force by France and England would do no harm and it might do some good.

Barbara Tuchman, in her recent book The Guns of August relates the events of the first month of the First World War, and she forcefully demonstrates that all the great powers - England, as well as France and Germany - had based their strategies on the wrong premises. Perhaps it is too much to hope that the decision with which England is now faced may be arrived at on a different basis, but it would be a major tragedy if it were not.

* * *

Postscript

In the long run, the proliferation of atomic bombs may be inevitable, unless the United States and the Soviet Union reach an agreement on arms control, that is based on the concept of the "minimal deterrent," and puts an end to saturation parity.

Russia recently accepted the American notion that America, as well as Russia, may retain a small strategic striking force until the end of the third stage of the disarmament agreement and that inspection shall not be limited to equipment which is to be destroyed but shall be extended also to equipment which is being retained. There are, however, no conversations in progress between America and Russia which would elucidate whether they both mean the same thing when they appear to be in agreement on the concept of the "minimal deterrent" and it is not possible to say whether they would be prepared and able to conclude an agreement on arms control on the basis of this concept. Therefore, the odds are that saturation parity is going to prevail in the predictable future.

It may be asked whether England and the other nations of Western Europe would not render a disservice to America by moving towards neutrality in saturation parity. Among several things to consider in this regard, there is also this to be kept in mind:

Neither America nor Russia want war, but a conflict centered outside of Europe might lead to war. Neither America nor Russia would want such a war to escalate, but it might escalate and it might well escalate to the point where America would have to draw for its recovery on the resources of Western Europe.

Several years ago, before Russia was anywhere near saturation parity, it would have been a foregone conclusion that in case of an armed clash between American and Russian forces, at some point along the line the Russian would put an end to escalation. But if such a clash were to occur in the fully symmetrical situation of saturation parity, then one could not predict which of the two countries would take the first step to halt escalation. And, if it is no longer possible to say who will put an end to escalation, then also one cannot predict just how far escalation might go.

If it came to an exchange of strategic strikes between America and Russia, their destruction might well go far beyond that which Western Europe experienced during the last war. And if it hadn't been for the Marshall Plan, the postwar recovery which occurred in Western Europe would not have taken place.

If there is another war,
/ America's recovery /~~after~~ /~~the~~ /~~next~~ /~~war~~/ might be brought about by a Marshall Plan in reverse, but only if the war were to leave the nations of Western Europe unscathed. Perhaps these nations, when they reach the point where they would formally proclaim their "neutrality" would pledge to devote a few percent of their industrial output to aid America, should she suffer major devastation in an exchange of strategic strikes

with Russia.

It may be asked whether in case of such a war a neutral Western Europe would not be too severely affected by radioactive fall-out to be able to render substantial economic assistance to America.

To-day, if Russia and America were to exchange strategic strikes, sufficient to demolish the twelve largest American cities (with a total of about 25 million inhabitants), and to cause a similar toll in Russia, the effect of fall-out on England and the rest of Western Europe would be negligible.

It is conceivable, however, that the arms race may enter into a new phase before long. Both America and Russia may be expected soon to deploy anti-missile missiles in defense of their rocket launching bases. For such a defense to be successful, it is only necessary that it prevent a ground burst of the incoming rocket and this is likely to be an attainable goal. But America and Russia might go further and deploy anti-missile missiles for the defense of their cities also. If this came to pass, America would almost certainly embark on a program of building fall-out shelters on a large scale for the population of her cities.

The building of fall-out shelters might not make very much sense for countries which may be expected to be a target of the attack, whether or not they deploy anti-missile missiles for the defense of their cities. For the neutral countries of Europe, however, such shelters would offer the kind of protection they would need if an arms race of this type were to get under way, and they could offer them adequate protection.

THE END

The Sting of the Bee in Saturation Parity

By
Leo Szilard

Introduction

When America and Russia will be in the position to destroy each other to any desired degree by an exchange of atomic strategic strikes, the nations of Western Europe will face a situation for which there is no precedent in history. On this occasion I do not propose to discuss the larger issues which will confront the world when nations can destroy each other ~~to any desired degree~~, in a rapid exchange of strategic strikes, rather, I propose to examine here only what France, Germany and England, ~~in particular~~, may do in order to safeguard their own security.

If a conflict between Russia and America had led to an armed clash a few years ago, and if at some point along the line of escalation, Russia had made a sudden attack against America's strategic air bases and rocket bases, then America's residual striking capacity would have been sufficient to demolish, in a counterblow, all of Russia's sizeable cities. If, conversely, America had made such an attack against Russia's air bases and rocket bases of known location, Russia's residual counterblow ~~would have fallen far short of demolishing all of America's sizeable cities~~ *could not have caused any comparable destruction.*

Today, America's strategic atomic striking forces might still be superior to those of Russia, by a factor of perhaps between three and ten, in the number of hydrogen bombs that they could deliver and, presumably, America could maintain this kind of numerical superiority in the years to come. She could not however, by doing so, keep Russia from steadily increasing her residual striking capacity. In recent years, Russia has steadily proceeded with the hardening of her rocket-

launching sites and the building of additional submarines, capable of launching long-range rockets, and to-day she has reached a point where her residual counterblow would be sufficient to demolish America's twelve largest cities, totaling over 25,000,000 inhabitants. This is a higher price than America would be willing to pay for reaching her political objectives, in any of the conflicts that might be expected to occur in the predictable future. In other words, Russia's "residual striking capacity" would be sufficient to-day to inflict "unacceptable damage" on America.

It is conceivable that America's striking forces ~~are~~ ^{might} still ^{be} superior to those of Russia in the sense that if it came to an all-out atomic war to-day, ~~while~~ America would lose all her major cities on the Eastern Seaboard and some of her cities in the West, ^{but} she could still recover from such a war, whereas Russia would lose all of her cities of over 100,000 and thus would suffer a "destruction of her society" from which she ~~would~~ ^{would} not be able to recover.

It is clear, however, that in time Russia must reach the point where her "residual striking capacity" would be large enough to demolish all of America's sizeable cities and at that point Russia will have achieved "parity of saturation." Moreover, there is reason to believe that such parity of saturation is now at most a few years away, if that much.

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Whatever balance saturation parity may establish, ~~it will be~~ ^{will be} a precarious balance, ^{could perhaps} yet, we ^{might be able to} live with it if there were universally accepted principles of international justice to which a reasoned appeal could be directed. In the absence of such principles, however, any one of a number of unresolved political conflicts could

lead to a war between America and Russia, ~~in saturation parity.~~ *in saturation parity.*

There appears to be a tacit understanding between America and Russia on spheres of influence in Europe and - barring local incidents, or an uprising in Eastern Germany - it appears unlikely that a conflict centered on Europe would lead to war between them. No such tacit understanding exists, however, outside of Europe and a conflict centered on the Far East, Southeast Asia or Latin America might lead to a war, even though neither Russia nor America want such a war.

Since the end of the last war, America's commitments in the Far East and Southeast Asia have been steadily growing. None of the issues, that have arisen there, are likely to be resolved in the predictable future and new issues ~~are likely~~ *may be expected* to arise from time to time.

America's policies in these areas are not motivated by either economic or military considerations, rather they are motivated by political considerations and these, at times, reflect the prevailing domestic pressures. The American Government knows very well, for instance, that the continued occupation of the off-shore islands of Quemoi and Matsu by the Nationalist Chinese forces ought to be terminated, and John F. Kennedy said as much before he was elected President, but because of the prevailing political pressures nothing was done about these islands after he was elected. President Johnson will have to operate under the same pressures.

After the war, many Americans came to believe that the fate of the world may depend on the outcome of a world struggle, that will be waged between China, Russia and their satellites on the one side and America as well as the rest of the nations - a few misguided neutrals excepted - on the other side. America's foreign policy in

the Far East and Southeast Asia, charted in the early postwar years, is based on this premise.

Oddly enough, if this premise were correct then America's proliferating involvements in these areas would be likely to trigger a world war before long. And only because it is becoming increasingly clear - as illustrated by the recent Russian-Chinese rift - that the premise is incorrect, can we assume that America could pursue her current policy, for a while, without getting herself, and the rest of the world, into very serious trouble.

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Regarding Latin America, the official American position is that the United States cannot co-exist with any communist country in this hemisphere, which looks for support to the Soviet Union, and, because this position has strong popular support in America, it is likely to endure.

At the time of the Cuban crisis, in October of 1962, it was widely believed that America had to risk war, because the transporting of a number of medium-range rockets to Cuba, would have upset the strategic balance.

X In fact, transporting these rockets to Cuba would have done nothing of the sort. There was no strategic balance at the time of the Cuban crisis and there is none to-day. Russia was proceeding then, as she is proceeding now, with increasing her residual striking capacity and she made a minor, rather than a major, step in this direction when she placed medium-range rockets on Cuba, which could be destroyed by a sudden strategic strike.

America was impelled to risk war in the Cuban crisis by political considerations, and not by any considerations of military strategy. Had Russia not yielded and had her ships continued their course en Cuba, in defiance of America's proclamation of the partial naval blockade of that island, American warships would have sunk Russian ships. No one can say how far escalation would have gone and whether Russia, being unable to resist America in the Caribbean area, would have retaliated elsewhere, perhaps in Europe.

America risked war in the Cuban crisis and on this particular occasion Russia yielded. It would be unreasonable to expect that in the years to come, Russia will yield always.

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France

Had the Cuban crisis led to a shooting war, it could have easily involved France also.

Let us consider first the unlikely case ~~that~~ ^{of} a war between America and Russia, arising out of a conflict centered outside of Europe, ^{which} ~~were~~ ~~to~~ start with a direct nuclear exchange between them. Such a war would be presumably of short duration and thus, while it might automatically involve the nations of Western Europe who remained an integral part of the American defense system, it would not be likely to involve nations in Western Europe who are not part of this system. Therefore, by disentangling herself from this defense system, France could presumably avoid being directly involved.

But if a Cuban type conflict were to lead to protracted hostilities between America and Russia, which stops short of an atomic war, Russia might retaliate against one of America's close political allies in Western Europe, whether or not they are an integral part of the

American defense system. ^{In order to} ~~France could~~ make reasonably ^{sure} ~~(sure)~~ ^{however,}

that Russia would not retaliate against her. *France would have to make* ~~it~~ it clear, well ahead of time, that she does not interpret the controversies centered outside of Europe in terms of a world struggle which would automatically align the so-called "free nations" on the one side and the Soviet Union, as well as China, on the other.

General de Gaulle recently took a long step in this direction when he offered the good offices of France to help accomplish the reunion of North Vietnam and South Vietnam. By speaking up on Vietnam, he went out of his way to make it clear that France does not recognize America as "the leader of the free world" in the current conflicts centered on South Asia.

It would appear that General de Gaulle is in no need to take advice from me in matters of foreign policy. He might not be in need to take advice from me in matters of military strategy either. I am less sure of this, however, because military strategy is an area where technical knowledge, and a dispassionate appraisal of the technological advances which may be expected, might come in handy.

I do not think that France could have an independent strategic atomic striking force which she could use to threaten a strike against Russia, in a conflict in which major French interests might be at stake, but not the very existence of France as a nation.

Still, before long, France could perhaps have a small striking force, consisting of submarines carrying long-range rockets, which could not be destroyed by Russia in a sudden attack, and which could demolish in a counterblow, say, three Russian cities. Such a strategic striking force might be compared with the sting of the bee, which is not, properly speaking, an instrument of defense, for when it uses its sting, the bee dies. Yet, the sting of the bee deters people from going

around catching bees, as long as they don't have any compelling reasons for doing so. If France ceased to be an integral part of the American defense system, and if she embraced the philosophy of "neutrality" in conflicts centered outside of Europe, then the Soviet Union would presumably have no reason to mount an attack against France and therefore such a small retaliatory capacity might be an adequate deterrent.

As long as France's strategic striking force consists of bombers, which would have to take off from air bases that could be destroyed by a Russian surprise attack, France is not in the possession even of "the sting of the bee." There is at the present time, however, no direct threat to the security of France, and by the time there may arise in Europe, as indeed it might, a new threat to her security, France, with a little luck, could be in the possession of a small, but invulnerable, striking force.

Two nations, like France and England could pool their resources and jointly develop submarines, rockets and bombs for the purpose of equipping themselves with a small strategic striking force. If, however, they were to place their striking forces under joint control - with both of them, having power of veto - then these forces could not fulfill the function of the sting of the bee.

It is probably true that if France had such a sting of the bee and never tried to use it for anything, except for threatening retaliation in case of an atomic attack directed against her own territory, then it would do no harm for France to possess such a "sting" and it would conceivably do some good. I am not in a position to say whether the statesmen of France understand at this time that a strategic striking force must not be used for any other purpose.

Having discussed what France might gain by becoming semi-neutral, it is also necessary to consider now what France might lose by doing so.

Right after the Second World War the security of France was threatened by the combination of communist pressure from the inside and the possibility of Russian military intervention from the outside. At that time many people believed, rightly or wrongly, that only America's possession of the atomic bomb saved France from falling under the domination of the Soviet Union.

There is no such internal threat to the security of France to-day, and were the Soviet Union to invade Western Europe she would find herself at war with the United States, whether or not NATO is retained, whether or not France is semi-neutral and whether or not America remains committed to the defense of Western Europe, in any formal sense.

To my mind, the possibility that Russia might deliberately set out to invade Western Europe does not represent a real danger to France to-day. But a border incident in Europe, or an uprising in East Germany, might lead to a war that neither Russia nor America want, and if it did - with NATO as it is presently constituted - the war might escalate to the point where France might be destroyed, along with the rest of Western Europe, in the process of being "defended."

If a war broke out in Europe, at some point during the see-saw of fighting, the Russians might be tempted to send their troops in hot pursuit across the pre-war boundary and they might penetrate deep into Western territory or, conversely certain NATO units might penetrate deep into Eastern territory. Clearly, the losing side would find it difficult to resist the temptation of resorting to the use of tactical atomic bombs against troops in combat, and once atomic bombs were

dropped, by either party on the other side of the pre-war boundary, there would remain no clear conceptual line at which further escalation would be halted.

To-day Russia and America find themselves in the same predicament in this regard and conceivably they could discuss with each other the limitations that they would have to impose upon themselves in Europe, concerning the conduct of such a war, in general, and concerning the use of tactical atomic weapons against troops in combat, in particular. No such discussions have taken place so far, however, and there are none in sight.

One may therefore ask whether, from the point of view of the safety of France, NATO - as presently constituted - would not represent a potential liability rather than a potential asset, in the next decade.

* * *

Germany

How is saturation parity likely to affect West Germany?

Let us ask ourselves, for example, what would have happened if there had occurred, a few years ago, a major uprising in East Germany against the established government and if substantial units of armed West German volunteers had moved into East Germany, to assist the insurgents.

Presumably, at first, one would not have known with certainty whether these volunteers were acting with the tacit approval, and active participation, of the West German Government, or whether they were acting against its wishes, and in disregard of its orders. Had such a contingency occurred a few years ago, the odds are that America would have extended protection to West German cities, on the ground *against the strategic striking forces of Russia*

that America must prevent the destruction of West German military power. America would have been likely to extend such protection to West Germany whether Germany was, or was not, the aggressor, and if there had been any doubt on that score, Germany would have been given the benefit of the doubt.

If a contingency of this sort were to occur in the years to come, and if the Russians were to fear that the clash might escalate into an all-out atomic war, they might decide to knock West Germany out of the war by dropping, all at once, between five and ten hydrogen bombs, on West German cities. Having done this, Russia would then be in the position to speak to America as follows:

"German aggression forced us to do what we did, lest the clash of arms escalate into an all-out atomic war, which neither Russia nor America want. We realize that America could now respond by demolishing one Russian city after another, but for every Russian city that America may demolish Russia would demolish one American city. Let's be ~~stupid~~ ^{stupid} about this. What has happened, has happened; let's see now where we go from here. Russia does not intend to occupy any West German territory and she is willing to put up a few percent of her industrial output to help rebuild the cities of West Germany, provided her contribution is matched, collar-for-dollar, by America."

The Russians would hardly be so foolish as to assume that the Americans would respond in a rational fashion if they were to drop bombs on American cities but, in the contingency described above, they might, rightly or wrongly, expect a rational response if they were to demolish German cities ~~and more to refrain from extending~~ ^{and more to refrain from extending} their attack to America's own territory.

* * *

Would Germany need to have an atomic strategic striking force in order to safeguard her security in saturation parity?

In 1931, I met with a group of friends in Berlin who thought that the time had come for Germany to re-arm, in order to be more secure.

I said to them that when Germany lost the war in 1918, her neighbors took from her all that they wanted and none of them wanted to take from Germany anything thereafter. I said that Germany did not possess anything that had to be defended by force of arms and thus, even though disarmed, she was quite secure; Germany would have to re-arm only if she wanted to recover by force some of the territories she had lost in the First World War.

My German friends assured me - and I believe they were sincere - that they were not thinking of recovering any of the territories lost; they just wanted to have as much security for Germany as possible. At first, they appeared to have some difficulty in grasping my argument, perhaps because of its very simplicity. After a while,, however, they seemed to get the point, or so I thought, until a few days later I met with them again and they started to argue the issue from scratch, from precisely the same point as before.

Evidently, they wanted Germany to re-arm, even though they did not know why they wanted this, and people who know what they want to do, but do not know why they want to do it, are rarely open to argument.

I could argue to-day that Germany does not need to acquire an atomic strategic striking force, just as I argued in 1931 that Germany did not need to re-arm, but to many Germans my argument might not sound any more convincing to-day that it did some thirty years ago. It is a foregone conclusion that there will be people in Germany who would want Germany to have such a strategic striking force and the only question is whether they are going to prevail.

There are those in America who believe that Germany can be kept from wanting to have a striking force under her own control, by setting up a strategic striking force under the joint control of America and

Germany, with perhaps a few other nations joining in. The multilateral strategic striking force under discussion would be equipped with two hundred Polaris missiles, enough to demolish two hundred Russian cities if each of them were to reach its target. Such a striking force would be substantial. It would, however, not give the Germans what they want, as long as America can veto its use, and there is reason to believe that the Germans propose to participate in it only because they assume that it may be possible for them to get rid of the veto.

The creation of such a striking force would make it possible subsequently to endow West Germany, by the mere stroke of a pen, with a substantial atomic striking force of her own, and few nations in Europe contemplate this possibility with equanimity.

In these circumstances one may ask whether it might not be preferable somehow to provide Germany, with a small striking force, just large enough to enable her to deter, on her own, an unprovoked Russian attack against her cities.

If Germany were to set out to develop on her own submarines, bombs and rockets for the purpose of acquiring a "sting of the Bee," the other nations would have little assurance that she would actually stop at having a small striking force. But if France and England were to develop jointly submarines, bombs and rockets, in order to equip themselves, each, with a small invulnerable striking force, ^{perhaps} ~~then~~ there ^{would} ~~might~~ not be too much objection raised, were they to give Germany a small striking force, just enough to let her have the sting of the bee also.

England

It is rather difficult to see current events in their historical perspective and it may be true that it is easier to see clearly the

the future than the present. In 1949, when the Russians exploded their first atomic bombs, I tried to look into the future and in an article printed in the NEW REPUBLIC (U.S.A.) in October of that year, I predicted that France would want to move towards a position of neutrality, when Russia achieves parity of saturation. I was not prepared, however, to make a similar prediction for England and I wrote instead:

② X "England may be different. England is no less vulnerable to bombs than the rest of Western Europe. But, after the fall of France, England decided to fight on in the face of the heaviest odds, and she emerged victorious. England might decide to hold out indefinitely as our ally and, with worse luck this time, perhaps suffer utter destruction in case of war."

Whether England is going to remain a close ally of the United States and an integral part of the American defense system, or whether she will adopt a position of "semi-neutrality" may well determine the shape of Europe in the years to come.

If England were to adopt a foreign policy and a military strategy somewhat similar to those of France, then French objections to England's becoming integrated with the rest of Western Europe would presumably disappear. Should England subsequently decide to enter the Common Market, in spite of the temporary economic disadvantages that this might entail, French and English economic power and political influence might balance those of Germany in Europe. If, however, England were to retain her special relationship with the United States, France might continue to resist the integration of England with the rest of Western Europe and Germany would then be likely to become the dominating influence in Europe.

② X If England were to adopt a policy of "semi-neutrality" she would presumably want to maintain a small strategic striking force that could function as the "sting of the bee." In fact, it might be

politically very difficult, or impossible, for England to move towards a position of 'semi- neutrality' if she did not keep up an independent and invulnerable striking force.

England is not likely to set up a strategic striking force large enough to come anywhere near saturation parity with the striking forces of Russia, and even if she did she could not make use of such a striking force for anything, except for threatening reëaliation in case of an atomic attack directed against her own territory. The threat of waging a massive atomic strike against Russia would be tantamount to a threat of murder and suicide and such a threat would not be believable in any conflict with Russia in which major English interests might be at stake, but not England's existence as a nation.

In these circumstances, one must ask whether England could stand up to Russia if she adopted a policy of semi-neutrality, whether or not she were to maintain an independent strategic striking force.

One might ask, for instance, what would happen if England were neutral and Russia were to invade the Middle-East and cut off Western Europe from Mid-Eastern oil. I personally doubt that Russia would make such a move in order to force Western Europe to buy Russian oil at higher prices, or for any other reason that comes to mind, and moreover, if Russia were to make such a move, she would be likely to find herself at war with the United States, whether or not England is neutral.

To me, it seems rather unlikely that Russia could make any military move against a neutral England that would affect a major English interest without getting herself into a war with America and it seems much more likely that, if England were to remain a close ally of America, a Russian-American conflict centered outside of Europe would involve her in a war with Russia.

There was a time when England had numerous political, economic

and military interests all over the world, and had to take risks in order to defend them. England could, and perhaps she should, reduce the risks that she is taking to the level of the interests that have remained.

It is being argued on the other side, that if England were to cease to be an ally of America, she would no longer have the kind of restraining influence on American policy that she exerted during the Korean War and again when France lost the war in Indochina. This argument may be correct, as far as it goes. But in a war, if ~~it were~~ ^{there were an early} ~~to lead quickly to an~~ exchange of strategic strikes between America and Russia, England as a military ally would be of little value to America, and if the war were protracted, she would be a burden to America, because America would have to protect her as best she can against retaliations by Russia. In saturation parity, England as a military ally ^{would} ~~will~~ be a potential liability rather than a potential asset ^{to America} and therefore she could hardly continue to exert a restraining influence on American policy of the kind she exerted in the past.

It would be probably still true, that were England to remain a close political ally of America then, in a contingency similar to the Cuban crisis, America would be restrained by the fear that Russia might in some way retaliate against England. It is questionable, however, whether England would want to exert a restraining influence on such a basis, and at such a price.

To sum up:

I believe that England would be more secure in the years to come if she were to adopt a position of "semi-neutrality" and were to maintain a small, but independent, striking force, just enough to function as "the sting of the bee." By pooling their resources England and France could jointly develop submarines, rockets and bombs and equip themselves each with a small but invulnerable striking force. Neither France nor England could use such a

striking force for anything except for threatening a counterblow in case of an atomic attack extended to her own territory. If this were clearly understood and kept in mind, the possession of a small striking force by France and England would do no harm and it might do some good.

~~some~~

Barbara Tuchman, in her recent book The Guns of August relates the events of the first month of the First World War, and she forcefully demonstrates that all the great powers - England, as well as France and Germany - had based their strategies on the wrong premises. Perhaps it is too much to hope that the decision with which England is now faced may be arrived at on a different basis, but it would be a major tragedy if it were not.

* * *

Postscript

In the long run, the proliferation of atomic bombs may be inevitable, unless the United States and the Soviet Union reach an agreement on arms control, that is based on the concept of the "minimal deterrent," and puts an end to saturation parity.

Russia recently accepted the American notion that America, as well as Russia, may retain a small strategic striking force until the end of the third stage of the disarmament agreement and that inspection shall not be limited to equipment which is to be destroyed but shall be extended also to equipment which is being retained. There are, however, no conversations in progress between America and Russia which would elucidate whether they both mean the same thing when they appear to be in agreement on the concept of the "minimal deterrent" and it is not possible to say whether they would be prepared and able to conclude an agreement on arms control on the basis of this concept. Therefore, the odds are that saturation parity is going to prevail in the predictable future.

It may be asked whether England and the other nations of Western Europe would not render a disservice to America by moving towards neutrality in saturation parity. Among several things to consider in this regard, there is also this to be kept in mind:

Neither America nor Russia want war, but a conflict centered outside of Europe might lead to war. Neither America nor Russia would want such a war to escalate, but it might escalate and it might well escalate to the point where America would have to draw for its recovery on the resources of Western Europe.

Several years ago, before Russia was anywhere near saturation parity, it would have been a foregone conclusion that in case of an armed clash between American and Russian forces, at some point along the line the Russian would put an end to escalation. But if such a clash were to occur in the fully symmetrical situation of saturation parity, then one could not predict which of the two countries would take the first step to halt escalation. And, if it is no longer possible to say who will put an end to escalation, then also one cannot predict just how far escalation might go.

If it came to an exchange of strategic strikes between America and Russia, their destruction might well go far beyond that which Western Europe experienced during the last war. And if it hadn't been for the Marshall Plan, the postwar recovery which occurred in Western Europe would not have taken place.

if there is another war
America's recovery ~~after the next war~~ might be brought about by a Marshall Plan in reverse, but only if the war were to leave the nations of Western Europe unscathed. ~~Perhaps~~ *Perhaps* these nations, when they reach the point where they would formally proclaim their "neutrality" would pledge to devote a few percent of their industrial output to aid America, should she suffer major devastation in an exchange of strategic strikes

with Russia.

It may be asked whether in case of such a war a neutral Western Europe would not be too severely affected by radioactive fall-out to be able to render substantial economic assistance to America.

To-day, if Russia and America were to exchange strategic strikes, sufficient to demolish the twelve largest American cities (with a total of about 25 million inhabitants), and to cause a similar toll in Russia, the effect of fall-out on England and the rest of Western Europe would be negligible.

It is conceivable, however, that the arms race may enter into a new phase before long. Both America and Russia may be expected soon to deploy anti-missile missiles in defense of their rocket launching bases. For such a defense to be successful, it is only necessary that it prevent a ground burst of the incoming rocket and this is likely to be an attainable goal. But America and Russia might go further and deploy anti-missile missiles for the defense of their cities also. If this came to pass, America would almost certainly embark on a program of building fall-out shelters on a large scale for the population of her cities.

The building of fall-out shelters might not make very much sense for countries which may be expected to be a target of the attack, whether or not they deploy anti-missile missiles for the defense of their cities. For the neutral countries of Europe, however, such shelters would offer the kind of protection they would need if an arms race of this type were to get under way, and they could offer them adequate protection.

THE END

FOOTNOTE

(for private circulation only)

I came to realize this in the fall of 1962 and thereupon I raised with Chairman Khrushchev the question of perhaps setting up conversations between a group of suitably-chosen Americans with their Russian counterparts. The American group was to include some dedicated young men who work within the Administration on the problems of arms control in a junior, rather than in a decision-making, position. I suggested that the participants on this subject should be deliberately chosen on both sides from among those who believe that a far-reaching reduction of the strategic striking forces is desirable. With luck, a discussion of such a "biased sample" of men could provide the two governments with a useful basis of discussion.

Chairman Khrushchev encouraged me to go ahead and to try to set up such conversations. The Administration in Washington had no objection to the participation in such a discussion of consultants of the Government, but they were divided on the issue of whether anyone who worked on the problem of arms control within the Administration may be permitted to participate in the project. After many months of discussion it was finally decided that no one who is on the Government payroll should be permitted to participate in the project. This killed the project.

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