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THE PEACEABLE GYPSIES

LONG ago, before there were nuclear weapons, all that scientists were supposed to talk about when they got together was science. Nowadays they also talk politics—the momentous, dilemma-ridden politics that are largely a by-product of their own experiments. Indeed, they sometimes travel great distances to do so—the most notable example of this being the attendance of scientists from all over the world at the so-called Pugwash Conferences, more formally known as the International Conferences on Science and World Affairs. While Pugwash, Nova Scotia, was the site of the first conference, in July, 1957, ten subsequent ones have been held, at irregular intervals, in such widely scattered parts of the globe as Russia, the United States, Austria, and England, and while the participants have included historians, law professors, and other such scholars, the meetings have primarily involved physicists, biologists, and chemists, many of them Nobel Prize winners. They have come from laboratories on either side of the Iron Curtain, their sole purpose being to seek ways of lessening international tensions. After the conferences, the scientists have attempted, with varying degrees of success, to communicate to their political leaders the ideas that have been discussed; more than one of those ideas, including the proposal for a partial test ban, has become the official policy of their governments. The Pugwash participants aren't always the same (though some are veterans of as many as six meetings), but the average number has been about fifty. The first several conferences were underwritten by Cyrus Eaton, the Cleveland industrialist—it was at his summer place in Pugwash that the original one was held.

THE most recent Pugwash Conference was held this fall in the ancient walled town of Dubrovnik, Yugoslavia, on the Adriatic coast halfway between Venice and Athens. I attended it, thanks to an invitation from the Pugwash Continuing Committee on behalf of the scientists and scholars who were temporarily abandoning their formal studies of nature and other fields to convene as a kind of parliament without portfolio. There were participants from twenty-four countries, including the Soviet Union, the United States, Great Britain, East and West Germany, Ghana, India, and Brazil. The Communist Chinese, whose scientists had been at previous meetings, had sent a carefully worded message to the Continuing Committee to the effect that they would not be coming this time; the Chinese academic year, it seemed, was just starting and all their scientists were needed at home for teaching duties.

The conference went on for five days, with the local arrangements taken care of by the Council of Yugoslav Academies, a national organization of learned societies. All of us were put up at a hotel on the outskirts of town called the Neptun, which, as time went by, revealed a susceptibility to power failures. The weather was hardly conducive to cerebrating about the world's troubles. The sky was almost perpetually unclouded, and a bluish haze lay torpidly on the flat Adriatic. The only thing that could possibly be construed as a reminder of the work at hand was a booming of artillery each morning—the guns being fired by the crew of an American movie with a Second World War plot, which was being made in the mountains nearby. The delegates needed no such reminders, though. They just couldn't get enough,

it seemed, of such topics as atom-free zones, the test-ban treaty, problems of detection, the abolition of delivery systems, and—the most formidable topic of all—general and complete disarmament, which English-speaking delegates referred to breezily as “g.c.d.” The colloquy began at breakfast—no matter what table one drew in the crowded dining room, one found the delegates hard at it—and it went on through the sipping of nightcaps on the Neptun's broad terrace; it persisted in the big buses that carried us daily over a winding road to the conference hall, in Dubrovnik proper; and it displaced small talk at the various receptions tendered in honor of the Pugwashers. “I wish we all had more time together,” Dr. Franklin A. Long, a professor of chemistry at Cornell, who until recently had been Assistant Director for Science and Technology of the United States Arms Control and Disarmament Agency, remarked to me. “There are men with incredible brains here, and you're not seeing them at their best. If only they'd been able to do their homework properly!” Another delegate had a plan to guarantee that they did nothing but their homework, by devoting their full time to disarmament studies. He wasn't a scientist himself, but a politician—the Right Honorable Philip Noel-Baker, M.P., a zestful, jaunty man in his middle seventies, who had won the Nobel Peace Prize in 1959 for his work in the field of international relations and disarmament, and who, incidentally, had been captain of the British Olympic team at Antwerp in 1920. “Scientists responded brilliantly to the crisis of the last war, and I believe they could deal just as effectively with this Cold War we have on our hands,” Noel-Baker told me one afternoon

while we were sharing a bus seat. "They're immensely able as a class. The changes they've made in our lives! Why, when I was a boy most people had no phone and no electricity, and my father had the third automobile to travel the streets of London."

There were times, of course, when the scientists actually were scheduled to discuss atom-free zones, delivery systems, and the rest. These were during their sessions at the conference hall, which was really an art museum, the Umjetnicka Galerija, whose high-ceilinged, chandelier-lit exhibition rooms had, through the good offices of the Council of Yugoslav Academies, been turned over to the conference both for plenary sessions and for the smaller meetings of so-called working groups. (One working group met at the Neptun whenever possible, because several of its members suffered from various infirmities and wanted to spare themselves the bus trips to the museum.) It was at the plenary sessions, I thought, that the general earnestness was most evident. The delegates would give their attention completely to the speaker of the moment, who, microphone in hand, addressed them from a platform that was also occupied by the conference's presiding committee, made up of five or six scientists of different nationalities. Only occasionally was there whispering among the audience, whose members sat facing the platform at two long, parallel tables covered with dark-green cloth. Usually, as they listened intently to papers being read or to greetings being relayed from the heads of various governments—including the United States and the Soviet Union—they took notes, stared thoughtfully at the room's white plaster walls, on which hung a number of indifferent abstractions, or gazed through a broad open window at a prospect of cacti and palms and, beyond this, the Adriatic's gelatinous calm. Most of the participants wore earphones, through which they heard the speaker's words translated by interpreters in a booth at the rear of the room; some, I noticed, had brought along dictionaries with which to check the translations.

Aware though I was of the idea back of the Pugwash movement, I still experienced a certain sense of unreality at seeing so many eminent scientists holding political court in a Balkan museum. There were, among others, Sir John

Cockcroft, a nuclear physicist in his sixties, with the features of a professional Ed Wynn, whose normal precincts are at Cambridge, where he is Master of Churchill College, and who was a recipient of a Nobel Prize in 1951; Professor P. M. S. Blackett, another Nobel laureate (Physics, 1948), whose professional habitat is the Imperial College of Science and Technology in London, where he is Pro-Rector; Professor I. I. Rabi, of Columbia University, a contemporary of Sir John's and of Blackett's, who won the Nobel Prize for Physics in 1944; Professor Francis Perrin, head of the French Atomic Energy Commission, a short, amiable physicist with an elegant goatee; Professor Leopold Infeld, a theoretical physicist at the University of Warsaw, who was once a close collaborator of Einstein's; Professor Bernard T. Feld, of the Physics Department of M.I.T., who was the chairman of the committee of the American Academy of Arts and Sciences which organized American participation in the conference; Professor Leo Szilard, the co-discoverer, with the late Professor Enrico Fermi, of the principles of the plutonium pile; Professor M. G. K. Menon, a physicist from the Tata Institute of Fundamental Research, in Bombay; D. K. Abbiw-Jackson, of the Kwame Nkrumah University of Science and Technology, in Kumasi, Ghana, a young mathematician with the springy gait of a sprinter; Academician V. A. Kirillin, a tall physicist with the demeanor of a genial schoolmaster, who is vice-president of the Presidium of the Soviet Academy of Sciences, the U.S.S.R.'s highest scientific body; another Soviet Academician, N. N. Bogolubov, who is a theoretical physicist of world renown; Major General N. A. Talensky, a Soviet military theoretician who writes for two publications, *War Thought* and *Red Star*; and Soviet Academician A. N. Tupelov, the famous designer of Soviet aircraft, a portly old man with two Orders of Lenin on his ample chest, who sat pensively through the plenary sessions.

The content of the discussions, both inside and outside the museum, was shaped largely by twenty or so papers on disarmament that the scientists had prepared in advance. Not a single one of these papers that I heard or read failed to mention international suspicion. (The conference itself was not devoid of suspicion; it was possible at various

times to hear Western scientists wondering aloud whether Eastern ones were independent spirits or government hacks pushing a Party line, and to hear Eastern scientists expressing similar doubts.) One of the papers was bluntly entitled "Cheating in a Disarmed World." It was the work of Professor R. R. Neild, of Britain's National Institute of Economic and Social Research, and it examined the widely held fear that the concept of disarmament is a delusion because one nuclear power or another would surely conceal bombs from internationally appointed inspectors. Neild, however, didn't think cheating would be easy in a disarmed world—a thesis he chose to develop by simulating the thought processes of theoretical cheating statesmen, whom he categorized as "gambling robots who have no purpose in life other than to destroy their enemies." Such robots would certainly be confronted by dilemmas, Neild asserted. Supposing, he speculated, one country were to threaten another with bombs that it had concealed from the disarmament inspectors. Why wouldn't it occur to the cheater that his intended victim might also have cheated? And why wouldn't he also worry lest he arouse the antagonism of unthreatened governments, whose ranks, for all he knew, might also include a cheater or two? "Those who argue that a threat by a cheater would work seem either to have failed to think through the problem or else to have made asymmetrical assumptions when doing so," Neild declared. "That is, they have assumed that one side, because of superior political morals, would never cheat, and that the other side would recognize this virtue and, as a result of inferior political morals, would take advantage of it by cheating and threatening to attack. I have never seen these assumptions spelt out and justified. . . . Whatever one's views about the morals of either side, it is hard to see either side crediting the other with superior honesty." Neild went on to show in detail the headaches that cheaters would have to face if, instead of merely making threats, they contemplated a surprise attack. He went so far as to doubt whether a surprise attack would even be possible in a disarmed world. At this point, he parted company with his "gambling robots," calling them a pet abstraction of "strategic analysts who postulate creatures of tireless aggression." By the time

disarmament accords were reached, according to Neild's reasoning, Communist and non-Communist leaders alike would have had to sell their public so hard on the unthinkability of nuclear war as a method of settling disputes that the prevailing political climate would be one such as we can hardly even imagine today. A climate of that sort, said Neild, could be achieved only gradually, and the same would be true of its reversal; that is, cheating, if it were to occur, would come not as a surprise but as the climax of a period of diplomatic warnings, attempts at conciliation, and, of course, heightened vigilance in inspection. "What you may suffer if the [disarmament] Treaty goes wrong is disappointment, not disaster," Neild concluded. "Disaster is what you may suffer if you don't make a treaty."

The papers varied greatly not only in their topics but in their tone and in their reasoning, ranging from the abstruse to the simple and everyday. One of them, entitled "A Role for Small Nations," written by Professor O. Kofoed-Hansen, a nuclear physicist at the Risø Research Laboratory, near Copenhagen, leaned heavily on a fairy tale by Hans Christian Andersen. Kofoed-Hansen held that it was the duty of small countries like his own to be as outspoken about the follies of "the two big camps" as was the boy in "The Emperor's New Clothes," who saw that the emperor was naked and said so. "Can the small countries learn to behave like Hans Christian Andersen's small child?" Kofoed-Hansen asked. "I hope they can, because they and their men are not so much hampered by fear of losing face and position, because they have less of it to start with."

A scientist from another small country, Austria, suggested an experiment for which, he believed, certain small countries could serve as "pilot plants." The countries he had in mind were European neutrals whose borders were not in dispute, and the heart of his proposal was embodied in a rhetorical question: "What will happen to this country if it disarms unilaterally and proclaims itself to be a test case of the possibility of peaceful coexistence?" The proponent of the experiment was Professor Hans Thirring, a short, genial man in his seventies, who is a professor of physics at the University of Vienna and a member of the Vienna Academy of Sciences, and is a revered public figure in his country.

If nothing else, Thirring said, the small countries would be saved the expense of supporting their "rather inadequate conventional forces." Economics would figure in the broader aspects of his experiment, too, he pointed out, for the United States and Russia, when each saw that the other had refrained from gobbling up the small countries, would come to feel easy enough about each other to do away with their staggering military budgets. This, Thirring predicted, would free vast amounts of manpower and capital with which the rivals could each show off their own systems to best advantage—a form of competition that would not cost the world its life. In casting about for likely "pilot plants," the Professor ruled out Switzerland and Sweden, on the ground that they had made so much of their armed neutrality for so long that "the idea of being a soldierly nation is a kind of 'ersatz' for the missed occasions to have fought glorious wars." The physicist ended up by nominating Finland, Ireland, and Austria to lead the way in total disarmament. He was particularly keen about his own country's fitness for this role, observing that "Austrians are not frustrated by lack of recent military glory, having fought bravely dozens of big battles and lost all wars in the last two and a half centuries."

A number of papers used technical language to make their political points. One author—a theoretical physicist from the Netherlands—sounded a little too theoretical to me. He saw the international situation in terms of a feedback system, illustrating his concept with diagrams whose components—International Tension and Distrust, Level of Armaments, External Political Influences—were connected by curving arrows that stood for Cause and Effect. "Feedback systems," he told a plenary session, "may be stable or not, depending on the value of the parameters characterizing the system. It seems that at present the system of the international situation is not really unstable (at least it does not show a *fast* exponential runaway), although positive feedback probably causes appreciable feedback amplification. But it should be stressed that a relatively small change of the parameters of the system, due to a technological change, might cause the system to become unstable. . . ."

Sir John Cockcroft, for his part, delivered a paper that was both technical

and readily intelligible. He took up the matter of improving methods for the detection of underground nuclear experiments, saying he believed that such improvements might facilitate agreement on a complete nuclear-test-ban treaty. Speaking of the recent partial test-ban treaty, he said that thanksgiving was in order for the fact that "the political sense of our leaders" had not heeded "the lunatic fringe of science," which was ever on the lookout for "more exotic types of nuclear weapons." Sir John didn't think that underground shots could contribute much to weapons development anyway, but he felt that if they were continued, some countries might come to fear that "the present balance of weapons technology" was being upset, and might exercise their right to withdraw from the treaty now in force. Sir John then reviewed recent progress in seismology, saying he believed that since 1958 the methods for the detection of underground explosions at distances of between roughly twenty-five hundred and six thousand miles had been improved thirty to fifty times. The central problem, he said, was still that of distinguishing earthquakes from explosions, and here he delivered a disquisition on the behavior of various underground shock waves, his general point being that the seismological signal for even a shallow earthquake was much stronger than that for a man-made explosion. After citing other criteria, he said that Russian and American scientists were in considerable agreement on the issue of underground detection. Their chief difference, he noted, was over the number of on-site inspections needed for checking "suspicious events," and this difference had been narrowed down to a point where Soviet negotiators believed that three inspections were sufficient and their American counterparts favored seven. "Because of the uncertainty of the data," Sir John said, "both numbers were scientifically reasonable, and . . . the actual number of inspections would have to be decided politically." He then ticked off a series of suggestions for making the data less uncertain, among them the use of unmanned seismic stations in regions of high seismic activity; the burying of seismographs in holes drilled to a depth of about ten thousand feet; and the placing of such equipment on the ocean bed. Of course, Sir John concluded, there was a limit to the scientific improve-

ments that could be made in detection, but that before that limit was reached, Russian, American, and British scientists should do everything in their power to compose their technical differences.

UNLIKE the plenary sessions, the meetings of the working groups were small and informal, with much of the atmosphere of seminars. There were five such groups, in each of which groups of scientists, varying in number from day to day, examined a particular topic. I sat in on one that was listed as "Working Group 5: The Partial Test Ban, the Problem of Detection, and the Next Steps." Its chairman was Alexander Rich, an M.I.T. professor of biophysics, and present at its meetings at various times were Cockcroft, Blackett, Rabi, Long, a young Harvard associate professor of biology named Matthew Meselson, and Academician L. A. Artsimovich, a short, broad-shouldered theoretical physicist, with brown, intent eyes, who was a member of the Presidium of the Soviet Academy of Sciences and Academic Secretary of its Department of Physicomathematical Sciences. The group's job was to examine the obstacles in the way of broadening the present partial test-ban treaty, and, along with the other working groups, to draft recommendations for submission to the final plenary session.

One obstacle that couldn't very well be examined was Red China's opposition to a test-ban treaty, since no one from that country was on hand.

"Would somebody care to act as an honorary Chinese?" Rich inquired at one point.

"Such an interesting psychology such a somebody would have to have," Artsimovich said, in his strongly accented English.

It was far simpler to consider some of the attitudes behind France's recalcitrance, for now Rich had only to invite a French delegate to step in and tell us about it. The Frenchman turned out to be Father Dominique Dubarle, a Dominican priest who is a professor of the philosophy of science at the Catholic University in Paris; his specialty is mathematical logic, and he has also done nuclear research at the Ecole Polytechnique. Father Dubarle wasn't at all sure that the government of France would forever refuse to sign a test-ban treaty. For one thing, he said, a public-opinion poll had indicated that half

of France did not share General de Gaulle's view of the present treaty. As for the General's hope of developing hydrogen bombs, Father Dubarle said, such weapons weren't expected to be tested before 1966 at the earliest, so there was time in which to enlist further public support for a change in French policy. The point that had to be driven home to his countrymen, he went on, was that the money spent on nuclear weapons could be better used for raising the standard of living; French scientists and thinkers, he believed, should disseminate this idea. He characterized those leading the drive for hydrogen bombs as strong-willed people who didn't want France looked down upon by other nuclear powers; General de Gaulle was hardly alone in his dreams of French glory, for in the opinion poll about a third of those who favored France's remaining in the arms race had given "prestige" as their reason. "It is so easy to imitate," Father Dubarle said, glancing at his Russian, American, and British colleagues. "It is the path of least resistance."

Despite endless hours spent in arguing the wisdom and the wording of this or that memorandum, the members of the working group engaged in no outright ideological quarrels. The nearest they came to one was when Dr. Long urged that the group go on record as favoring a program of research in underground detection techniques, to be conducted jointly by American, British, and Soviet scientists.

"Jointly?" Artsimovich asked at once, blinking. "But that's like a professor making a partner of a pupil. You have been so much more interested in seismology than we—you have had ninety-eight underground tests to our two."

No one disputed Artsimovich's point, but after a moment Long, who is a Montanan with a friendly manner, reiterated his thought.

Rabi said, "Anything that carries forward the good will generated by the test-ban treaty is all to the good. I think Long's idea falls in this category."

Artsimovich didn't seem to be listening. His eyes were shut, and his head was rocking slightly from side to side. When he looked at his colleagues again, he spoke with an impatient openness. He didn't suppose that Long's proposal would do any harm, he said, but he didn't really see that it would do much

good. Everything they were talking about, he said, hinged on an American overconcern with on-site inspections and on his country's resistance to the idea of what it considered too many inspections. The solution, said Artsimovich, had to do with a mutually acceptable number of inspections, as Sir John's paper had suggested, but how did one arrive at such a figure? The Russian recalled that at the Pugwash Conference last year, in London, a small group of Russian and American scientists had gone off by themselves, determined to lick the problem on a strictly scientific basis. But it hadn't worked. The Russians' calculations had led them to the conclusion that one inspection annually would be sufficient; the Americans had come up with fifty as their figure. Both answers could be defended scientifically, Artsimovich said, depending on how suspicious one considered "suspicious events." If one wanted each and every suspicious event investigated, he explained, that would mean from fifty to seventy inspections, but if one assumed, as most scientists did, that only a *series* of underground tests could have military significance, then the number of inspections need be nowhere near that high. "There is no simple relationship between the number of inspections, on the one hand, and the number of suspicious events, on the other," Artsimovich told Working Group 5. "That is what the scientific point of view shows us. Everything depends not on jointly improving detection techniques but on trust and confidence."

BETWEEN sessions at the museum, the delegates, I found, were sometimes willing to talk about themselves and about why they had seen fit to leave their labs and come to Dubrovnik. One of those scientists who talked to me about this and related matters was Professor Arne Engström, a tall, blue-eyed Swede who is a cell physiologist and biophysicist at the Karolinska Institutet, a medical-research center in Stockholm, and who is also a member of many Swedish government committees, including one that helps choose Nobel Prize winners. "The day of the ivory tower is over for scientists," he said as we sat at a table on the Neptun terrace having a beer. He added that he wasn't really sure there had ever been such a day. More likely, he conjectured, the wider implications of scientific work had gone unrecognized

by the public, by governments, and by the scientists themselves. Nowadays, though, science and technology had become the most superficial sort of status symbol. He told me that he had recently been impressed by this during a flight aboard a Sudanese plane. "It was a big, sleek, shiny jet with all the trimmings," he said. "I wondered why the Sudanese, who aren't usually in a hurry, should have gone to such unnecessary expense. The only answer I could think of was that they wanted to put their best foot forward for all the world to see." It was modern weapons, of course, that had changed everything, he went on, including his own country's concept of neutrality. Sweden, he said, could no longer wait for a war to demonstrate its traditional neutrality. She felt that she had to be neutral in advance, so to speak, and for that reason he and other Swedish scientists were engaged in a vast "protection-research" program, involving deep shelters, inhalation masks, and other civil-defense measures. Professor Engström eyed his glass of beer. "Another thing—a Danish friend of mine has told me that practically any brewery can be turned into a production center for cholera toxins," he said. "Just throw up some barbed wire and post a few guards, my friend told me, and you have a military emplacement that can wipe out thousands. The scientist's chief moral concern today, I believe, is the creation of just such potentialities. The difficulty is that the matter isn't always as black-and-white as the conversion of breweries. In science, one man does basic research and another puts it to practical use. Where does accountability lie? There's the gamble, and I know it well. A year ago, as you know, the Nobel Prize was given to a research team for bringing about a deeper understanding of the genetic code, of the mechanism of heredity. Well, I was the man who presented the case for that research to the Nobel Prize committee, and all the time I was analyzing the achievement, I was thinking, My God, what am I doing? In ten years, this research can make dogs of the human race."

Father Dubarle talked with me shortly after he had briefed Working Group 5. This wasn't his first Pugwash Conference, he said as we shared a bench outside the hotel—nor, he hoped, would it be his last. It was his belief that the Pugwash movement was helping scientists become intelligent in a "uni-

versal" way. Problems of the kind that we are now up against, he said, don't lend themselves to a nationalistic approach—although, he added with a smile, he wasn't sure he hadn't encountered just such an approach at the Pugwash meeting a couple of years before, in Kitzbühel, Austria. "A Soviet colleague, seeing how I was dressed, walked up to me and asked, 'Are you an observer for the Vatican?' When I explained what I did in France, he said, 'That's odd. We have monks in my country, but none of them are scientists.'" Not many decades ago, Father Dubarle continued, science itself was beset by nationalism—people spoke of a "German science" and a "French science," and so on, and each variety had its boosters and detractors. But that narrow view had largely disappeared, and this, in Father Dubarle's opinion, was all to the good, since he himself thought of science as "creating a world community of knowledge." Politically, though, he said, the issue at present was "to create a world community of generosity," and it was in this area, he believed, that meetings like the Pugwash Conferences might bear fruit. "Scientists have much to learn about politics," Father Dubarle said. "We are not yet nearly as realistic about politics as we are about nature. But there, of course, we have a good method of investigation that has evolved over centuries. If we want to learn about fundamental particles, for example, we use that method for organizing our experiments. But just because we have no such method for dealing with political problems doesn't mean that we shouldn't try to solve them. Perhaps, if we are granted the time, we may even create a political method."

"Do you think that guilt brings some scientists to the Pugwash Conferences?" I asked.

"Yes, but I think there is much more of a feeling of responsibility than guilt," he replied. "Certainly we have our sins, but the one good thing that we can do by way of expiation for the bomb is to bring about a new type of social atmosphere."

I WAS especially curious to hear the views of scientists with Communist backgrounds. Perhaps the Soviet delegation included a political watchdog or two, but none of the Russians I happened to talk with sounded like one. Certainly Academician Artsimovich didn't, one day when he and I lunched

together at the Neptun.

"What qualifications do you think scientists have for forming judgments on political matters?" I asked him.

"We have one or two good features," he replied. "We have a comparatively high degree of honesty. That comes from our scientific style of thinking, which is carried on without reference to the opinions of other men. And we are comparatively independent, which also comes from our scientific training. We direct our thought to the problem we are working on. We are not easily distracted—comparatively, I mean." Artsimovich laughed. "One further thing," he said. "We are not paid for these qualities. If we were, they would disappear at once."

A moment later, another quality without monetary reward occurred to him. "I think we are better educated than politicians," he said. "I am here, so take me for an example. I think I know more about philosophy, history, and geography than most politicians. Do you think most politicians are able to imagine what would have happened if General Burgoyne had not surrendered at Saratoga? Do you think they know who killed Henry IV of France for recognizing the religious rights of the Huguenots? Or the name of the general who led the charge on Cemetery Ridge at Gettysburg?" It was possible, Artsimovich went on, that scientists were a bit cocky about their ability to solve political problems. "This century has seen a whole realignment of natural scientists and social scientists," he said. "We natural scientists have become too self-assured since the bomb. There has been a sudden surge for us to levels of high importance."

I mentioned that an increasing number of social scientists had been coming to Pugwash Conferences, and Artsimovich made a face. Generally speaking, he said, he found social scientists a pretty ineffective bunch. "Gatherers of material," he said. "Fifty years ago, Professor Rutherford, the great British physicist, said that scientists were divided into two categories—physicists and stamp collectors."

The Russian shut his eyes, and then shrugged as he opened them.

"We scientists have become like gypsies," he said. "We wander from conference to conference, trying to find roads to peace, acting as voluntary advisers to our political leaders. We know better than anyone else what there is to be

concerned about, so it is possible that, without trying to, we have become the most peaceful people in the world."

Another Soviet Academician I talked with was B. M. Vul, a stocky Ukrainian with a cordial manner, who was probably a few years older than Artsimovich.

I asked Vul, who is an experimental physicist, if he didn't think that the conflicting ideologies of his country and the West hindered the Pugwash deliberations.

He shook his head. "We are discussing here survival, and without that there can be no ideologies of any kind," he said. "It is for always bearing in mind such a purpose that the discipline of the scientific method is especially valuable."

"Doesn't the scientific method require controlled conditions?" I asked.

"Yes," he replied. "In my laboratory, I create the conditions. I decide the temperatures and pressures. But with politics, I find a fixed condition, so what do I do? I try to apply the method I already know not only to deal with the issues that are pressing but to develop and extend the method, so that it can deal with supposedly uncontrollable factors. With nature, this approach has often helped us to discover the behavior of factors that were thought to be uncontrollable."

I asked him if he thought scientists could help matters by refusing to devise any more weapons. It was too late for that, Vul answered; too many weapons were already in existence. Like Father Dubarle, he thought that only a change in the social atmosphere could produce a true peace. "In my opinion," he said, "scientists have some influence with politicians, and this is fortunate, because scientists trust each other. We deal with objects and we try to be objective. For politicians, the world cannot always be so real. When politicians meet, each assumes the other is a liar."

Finally, there was Academician A. A. Blagonravov; a silvery-haired engineer with thick gray brows, who, I was told, is a leading figure in his country's space activities. ("You might almost say he was the Communist space czar," one American delegate had said.) With the aid of a Soviet interpreter, Blagonravov and I chatted over tea during a half-hour break at the museum.

The conference, Blagonravov said, was meeting in a congenial atmosphere,

coming, as it did, so soon after the signing of the partial test-ban treaty; other Pugwash Conferences had met at less fortunate times.

I mentioned the fact that some military men in the United States had been opposed to the partial test-ban treaty, and inquired if this had also been true in the Soviet Union.

Blagonravov said that he himself had not heard of any such opposition, and he reminded me that the highest-ranking military men in his country were members of the Communist Party, which meant that they adhered strictly to its political decisions.

I asked Blagonravov if he thought that those in the Soviet delegation had a sense of guilt about weapons work they might have done.

"No, I do not think this is true of the delegation," Blagonravov said, speaking slowly to the interpreter. "But perhaps your question could apply to me personally, because in the last war I developed an automatic weapon that was widely used. I do not know how many lives it took, but when I saw the consequences of the war, I was determined not to take part in weapons work again. I am not doing so now. I am in space research. My special interest in it has to do with automation."

Blagonravov smiled when I inquired why he had chosen to come to Dubrovnik.

"I like being with scientists," he told me. "I prefer it to being with diplomats, with whom I have also been many times." Blagonravov waited for the interpreter to finish translating this, then said, in a changed tone, "I am a member of society, that is why I am here. We scientists want to stay alive, the same as everyone else. We have work to do."

AT the final plenary session, which was held in the late afternoon, the chairmen of the working groups submitted their committees' proposals for acceptance by the whole conference. No pitched battles developed between East and West in the discussions that followed. There was no trading of ideological slogans. There were arguments, among them some between fellow-members of delegations, including the Soviet delegation. All the recommendations were weighed with the utmost gravity—so much so that one might have thought the proceedings were those of a deliberative body vested with political power. It was, however, precisely the

lack of such power that kept the scientists from appearing self-important. In the absence of that power, as far as I was concerned, there was nothing to do but remember that they were intellectual men voluntarily using their intellects in behalf of a complex and uncertain cause.

Pretty nearly all the proposals were accepted, including that of Dr. Long's group for a joint seismological study. (At the last meeting of Working Group 5, Artsimovich had decided to go along with it.) A number of other recommendations came from the working groups. One of them was that the International Atomic Energy Agency, in Vienna, be authorized forthwith to keep fissile material for power reactors from being diverted to the manufacture of weapons. "Production of fissile material in nuclear-power technology now surpasses that for weapons use," the recommendation stated. "Thus, the essential material base for nuclear-bomb production is arising at many points throughout the world. . . . With the rapid growth of nuclear-power reactors, little time is left to establish a pattern of responsible use that would provide protection to all countries against the diversion of plutonium to nuclear weapons. . . ." Another recommendation sought to forestall surprise attacks by conventional armed forces in Central Europe through the establishment of international control posts at major transportation centers inside the NATO and the Warsaw Pact countries; observers at such posts would be able to sound warnings if large numbers of men and arms were massed. This plan also included a proposal that military men from each side, with facilities for rapid communication with their governments, be stationed with the troops of the other side.

One working group proposed that strong inducements be offered in order to get countries to refuse to make nuclear weapons. Such nations, its recommendation stated, should be guaranteed the protection of the great powers, within the framework of the United Nations, and should also be given access to all the scientific knowledge they might have gained from the production of nuclear weapons. Another working group urged the establishment of a new, permanent International Disarmament Organization to oversee the process of disarmament and its subsequent control; the agency would guard not only

against actual cheating but against the fear of such cheating. "Since no inspection system can be perfect," the proposal declared, "greater efforts might profitably be made to devise machinery to deal openly with the doubts and fears which must inevitably arise from time to time."

The list of ideas went on and on. There was no telling what might come of any particular one of them. Perhaps nothing would. Perhaps the scientists would decide that they should refine it further at a future conference. Or perhaps, as has happened in the past, it would next come up in some august international forum, sponsored by a Foreign Minister. Whatever their final disposition, the proposals that were being put forth in the art museum were so many additions to a treasury that statesmen could draw on whenever the strange flux of international relations made it possible. "I can't prove it," Artsimovich said to me, just as he was leaving to return to Russia, "but without conferences like this one, it would be harder than it is to imagine that things are going to be better."

—DANIEL LANG

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