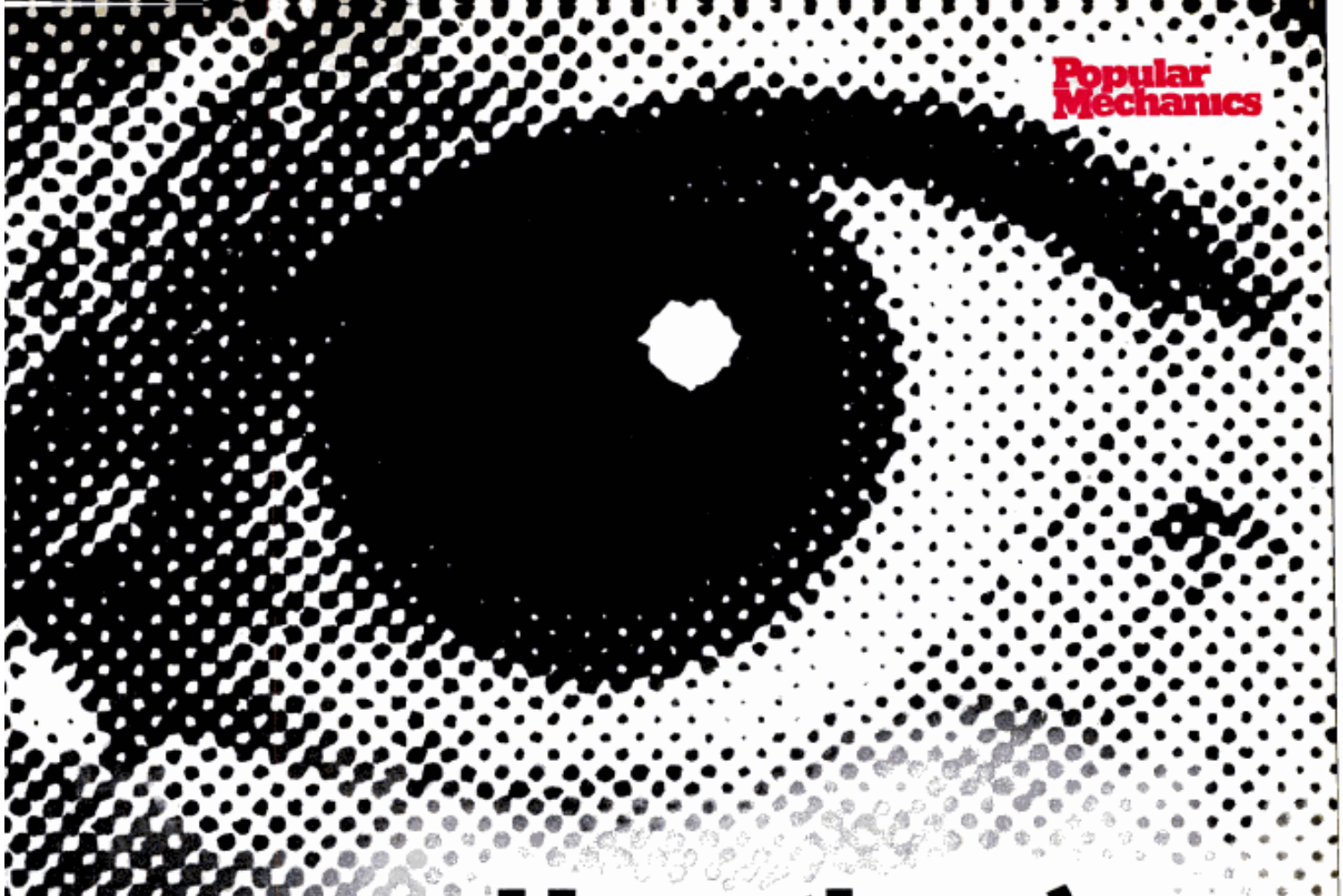
Popular Mechanics



How they're watching us

They—the Soviets—use exotic gear, from microwave system to spy satellite, to keep tabs on us. But when it comes to space-age spying, they're still rated only second best.

by Edward Hymoff

Spying isn't what it used to be. Gone are the days when it was considered something of a game for dashing cloak-and-dagger operatives ever on the prowl for secret documents. Science and technology have changed all that. For the most part, the daggers are sheathed and the cloaks are in mothballs. Today, intelligence agents spend their time more profitably in analyzing reams of computer printouts, studying aerial and satellite photos and listening to tapes of intercepted conversations.

The recent microwave controversy is a good example of what goes on. Early this year the United States protested against the Soviet practice of radiating the upper floors of our Moscow embassy with microwaves. Though our diplomats didn't say so, it was thought that the Russians were either trying to reduce the effectiveness of antennas on the embassy roof (antennas for monitoring equipment) or were using the microwaves in an attempt to intercept conversations.

Microwaves are short radio waves that travel by line of sight, like an FM transmission. They are employed in long-distance telephone communications, in radar operations and in the latest type of home cooking oven. They also are used in connection with resonators to eavesdrop on conversations in rooms that are in the line of sight of the listening post. Reson-

Spy-in-the-sky satellites are used by both Russia and U.S. America's ERTS satellite (left) has taken shots of rocket base near Moscow.

Listening post: Roof of Soviet embassy in Washington, D.C., sprouts antennas that reportedly enable Soviets to monitor long-distance phone calls, radio signals.

Sight on microwave generator enables the operative to aim unit at resonating surfaces in office he's monitoring—a neat way to listen in on conversations.

ators—small metal canisters or metal sheets—may be buried in the walls, ceiling or floor of a room. Metal wastebaskets, airconditioning ducts or other metal devices also function as resonators.

A resonator vibrates in response to pressure changes in the air, changes produced by sounds, including conversation. When microwaves hit a resonator, they "pick up" the vibrations. Reflected, the beam travels back to the receiver operated by the eavesdropper. Electronic processing is then used to reproduce the spoken words.

U.S. embassy bugged

Powerful microwave pulses, such as those utilized by military radars, are harmful to human beings. They can burn human cells as readily as they cook a roast in a modern microwave oven. But the official U.S. protest was directed at the relatively weak radiation that Soviet agents were using. Over a period of time, these weak beams can cause a variety of human complaints, ranging from headaches to irritability and insomnia. Long-term effects may be more serious.

It has been known for years that foreign diplomats in Moscow are the targets of KGB (Soviet secret police) surveillance. More than 15 years ago, for example, the Soviets presented a replica of the Great Seal of the United States to our diplomats in Moscow. This insignia is displayed in all United States missions, and so the Soviet gift was hung in an office in our embassy. Some time later it was discovered that the handsome plaque was bugged.

But all this was ancient history when the latest microwave operation surfaced. Stung by unfavorable publicity, the Kremlin finally owned up to the fact that the American em-

Global spying is a duel of sophisticated electronics

Russian surveillance of U.S. embassy in Moscow includes beaming of microwaves in an attempt, some experts say, to monitor conversations.

Soviet "freighters" loaded down with sophisticated electronic gear have a habit of showing up in waters where American forces are conducting weapons tests.

bassy was being hit by microwaves, but attributed the radiation to "the functioning of radio and television stations, other means of communication and some industrial enterprises . . . There is nothing unusual about it. It is a physical phenomenon known to every schoolchild." The Soviet

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In 1960, Ambassador Henry Cabot Lodge displayed at the United Nations a replica of the Great Seal of the United States. A present from the Soviets, it had hung in our embassy in Moscow. Ambassador Lodge points to hidden listening device.

Sensor-equipped satellites orbiting hundreds of miles above the Earth, spy ships, microwave generators and receivers, tiny listening devices—they all play a role in today's espionage operations. To a great extent, the cloak-and-dagger operative has been replaced by the engineer and technician.

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newspaper *Izvestia* also expressed the view that the array of antennas atop the American embassy "may be the source of the microwaves."

Diplomats of all countries are averse to discussing spy activities, a situation that has tended to keep a lid on the extent of Soviet spying on Americans in Moscow and elsewhere in the world. Of course, that same lid also serves to hide the tremendous American intelligence effort directed at the Soviets and other Communist nations.

But from time to time, spy capers do become public knowledge. In 1973, a miniature electronic bug dropped from a slit in the lining of a chair in a committee room in the House of Representatives. This was the room used for closed meetings of the House International Relations Committee. Though the bug's battery was dead, the unit—traced by the FBI to the KBG—reportedly had been operational during discussions of disarmament talks, military aid and the Vietnam withdrawal.

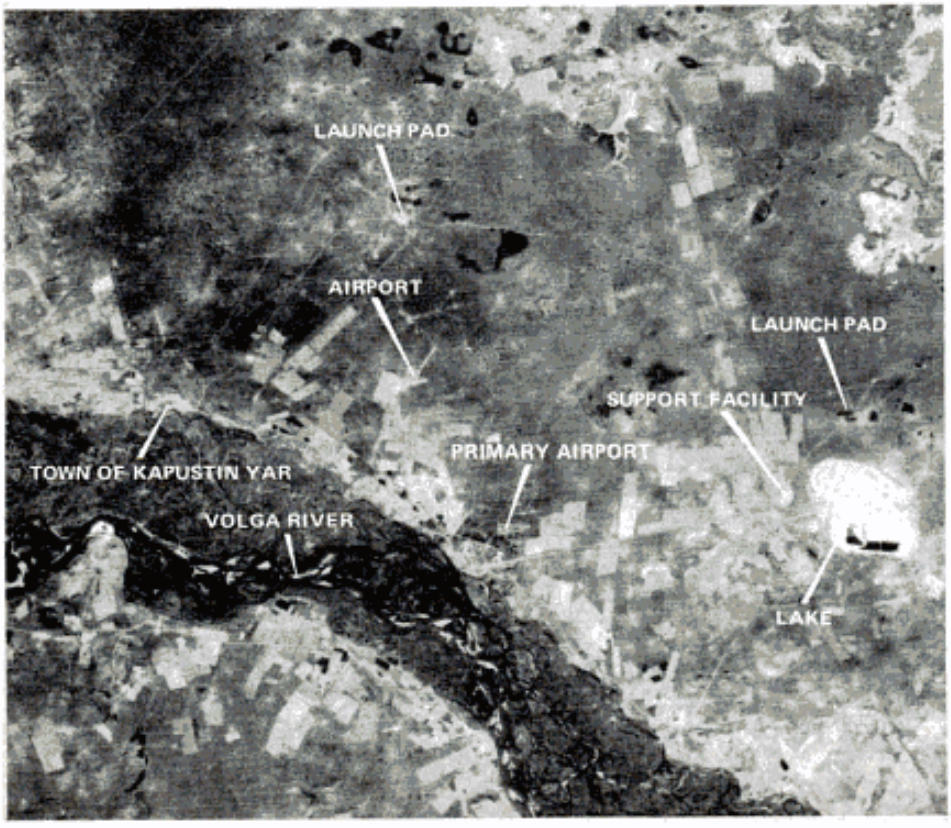
The trade fair ploy

Ironically, the listening device was of American manufacture and could have been bought almost anywhere in the United States. The Soviets have never been averse to buying American-made electronic surveillance equipment. In August 1974, the Russians put on an international trade fair for law-enforcement technology —*Krimtekhnika '74*—and invited American manufacturers to display their goods. When the news got around, various Congressmen blasted American companies planning to participate, and the Administration was forced to institute new export restrictions to prevent the Soviets from buying our latest surveillance gear.

The "Cold War" that followed World War II triggered increased intelligence operations between the United States and the Soviet Union. It was inevitable that the emphasis would be on science and technology. During the Cuban missile crisis in 1962, for example, the Soviet navy dispatched "fishing trawlers" laden with electronic gear to monitor U.S. Navy communications. In 1963, a big Soviet naval force sailed into the Mediterranean, which the United States had dominated for so long. The Soviet ships were immediately shadowed by elements of the U.S. Sixth Fleet.

In retaliation, the Kremlin complained that the Russian navy had recovered a piece of American undersea electronic warfare equipment—a U.S. Navy sonobuoy—in Russian coastal waters. On July 15, 1963, Defense Secretary Robert McNamara, at a press conference in the Pentagon, dramatically pointed to an elongated, torpedolike device and announced that it was "a Soviet sonobuoy, of which we have recovered about 200."

Soviet rocket launch facility at Kapustin Yar, 600 miles southeast of Moscow, was photographed by ERTS-2 satellite from altitude of 570 miles. Only part of ERTS photo is shown.



Found by Canadian divers

This marked the first time that a senior American official had publicly acknowledged information kept secret since 1959 when Canadian divers, helping to map the Atlantic continental shelf, came across electronic homing devices planted by the Russians. It was also in 1959 that a lone freighter appeared in the area of Kwajalein atoll in the Marshall Islands, far from the regular shipping lanes. It so happened that the ship was just in time to observe a hush-hush test of the American Nike Zeus antimissile missile. The ship's presence became known too late—a long-range Atlas ICBM had already been launched from Vandenberg Air Force Base in California as a target to test the effectiveness of the Nike Zeus.

Radars aboard ships and aircraft picked up the first blips of the oncoming Atlas. Suddenly a voice broke from the master control loudspeaker in a blockhouse on Kwajalein.

"Cancel test! We're under observation!"

But it was too late. The Nike Zeus had to be launched—the countdown had progressed beyond the point of no-return. Flame billowed from the rear of the Nike Z and it roared into the sky. High over the Pacific and 100 miles from the tiny atoll, a flash of brilliant light marked where the two warheads met and detonated, providing the Pentagon with proof that the Nike Zeus ABM would work.

Spy ship identified

The demonstration also impressed the crew of the freighter, later identified as the *Kharkov*. Sophisticated electronic gear aboard the ship had recorded every detail of the antimissile test, including voice communications of American technicians. A U.S. Navy Neptune patrol plane circled the ship and made a series of still and motion pictures. And that was the only action taken. After all, the *Kharkov* was on the high seas, as she had every right to be, and could not be intercepted.

This was electronic spying of the highest order and the Soviets had every reason to be proud of their coup. They had accomplished it in the open, thanks to what was then the Kremlin's new naval policy: the use of a massive fishing and merchant fleet as a tool of Soviet intelli-

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gence. At the same time, Russian nuclear and conventionally powered submarines have for years been mapping undersea routes from bases in the Baltic Sea, Caspian Sea and the Pacific—routes that lead to missile targets in the United States.

High-flying spies

All this technology-based snooping is as productive, if not more so, as spying in the classic manner. Manned spacecraft, as well as unmanned spy-in-the-sky satellites, have become for the Soviets and the United States the ultimate intelligence-collecting agents. From the time of Sputnik I (October 1957) through the end of 1975, the Soviets launched 586 spy-in-the-sky spacecraft representing the major part of the 878 successful launches monitored by the United States. In 1975 alone, of 89 Soviet launches, 62 were for military and intelligence purposes while 9 of 19 American launches were related to intelligence gathering.

Much of the Soviet space effort parallels American programs. The Russians have orbited *Meteora* weather satellites and *Molniya* communications satellites, and they cooperate with America in disseminating weather information. This cooperation is based on an international treaty. Ironically, during both the Korean War and Vietnam conflict, the Russians supplied the United States with daily reports of Asian weather, which was a real help to our armed forces.

On the other hand, the Soviets helped the North Vietnamese by using satellites to photograph U.S. and allied military bases and naval vessels. Soviet trawlers also monitored B-52 missions from Wake Island and bases in Thailand.

Planes play a part

American experience in air surveillance goes back many years. In the late 1940s and through the mid-1950s, RB-47 Strategic Air Command bombers, converted to electronic platforms, flew along the USSR coastline and occasionally "wandered into" Soviet air space, but well out of antiaircraft and missile range. Several planes were lost on these missions. But the operation served a good purpose: Photos were brought back and Soviet air defenses, committed to meet each challenge, were monitored by huge radars installed by the U.S. Air Force in Turkey.

The slow and high-flying U-2 spy planes forced the Russians to develop higher-altitude antiaircraft missiles, one of which brought down CIA pilot Gary Powers in May 1960. The U-2 was followed by a second-generation spy plane, the SR-71 Blackbird, capable of dashes at Mach 3 some 20 miles above the ground. Then came the spy satellites.

In all phases of technologically based spying, the United States has managed to keep a step ahead of the Russians. Round-the-clock surveillance of Soviet diplomatic and intelligence personnel in this country, for example, is carried out by the FBI, equipped with the latest in wiretaps, bugs and exotic hardware like a laser device that functions in a way similar to the microwave generator and receiver described earlier. Focused on a window in a room where people are in conversation, the radar beam bounces back from the glass pane, which acts like a mirror. Speech within the room causes the window pane to vibrate, and these vibrations are picked up by the radar beam. The radar "image" of the vibrations is then converted into speech by a special receiving set.

Our supersecret agency

Overseas, CIA agents often dog the tracks of their Soviet counterparts in operations in Western and third-world countries. As opposed to eyeball surveillance, responsibility for plugging into the vast Soviet communications network belongs to the National Security Agency, which employs some 25,000 people (90 percent of whom are civilians) and has an annual budget of $1.5 billion. In contrast, the CIA has 16,000 employees and an annual operating budget of $750 million. Though NSA is the more costly operation, this agency is exempt from the sharp Congressional scrutiny the CIA has undergone recently.

The supersecret NSA snoops electronically from isolated bases abroad, at sea, in the sky and in space, and utilizes a space surveillance system code-named "Dark Fence." Using high-performance computers, NSA's cryptologists decode and translate intercepted messages that are later provided to the CIA and the Defense Intelligence Agency for analysis. As far back as 1961, NSA monitored—from bases in Pakistan and Turkey—a secret Soviet attempt to launch three cosmonauts, one of them a woman, from Baikonur (now called Star City).

Other tracking stations in Canada, Hawaii, West Germany, England, France, Sweden and Italy locked on the space-craft as it was plotted in a decaying orbit.

"We are studying the program,"

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the spacecraft commander transmitted to ground stations in the Soviet Union and to trawlers at sea as the cosmonauts frantically attempted to correct malfunctioning controls. "The situation becomes critical for us. Something went wrong. We are changing our course. . .

"I want to talk to the director, do you understand? If we do not get out of this, the world will never learn about it anyway. You will know what to do . . . What? . . . What?

"Here! . . . Here, this is something! . . . there is something! . . ."

Those were the last words heard from the spacecraft. Contact was lost at 20:00 hours Baikonur time, May 17, 1961. In May 1963, NASA official George L. Simpson Jr. admitted to a Congressional committee that his agency was aware of Soviet space failures but that the Pentagon and NSA had stamped the highest secrecy labels on this information.

A tearful farewell

On Apr. 25, 1967, NSA's powerful antennas in Turkey monitored a live television contact, not broadcast in Russia, between a tearful Premier Aleksei N. Kosygin and Soyuz I cosmonaut Vladimir M. Komarov. The cosmonaut had been informed by Soviet ground control that braking parachutes designed to lower his spacecraft safely to earth were malfunctioning and that there was no hope he could be saved. Soyuz I crashed in Russia.

Another U.S. program, Operation Holystone, a major effort authorized in the early 1960s, was concluded two years ago because it had become extremely dangerous. In this operation, the U.S. Navy's fastest nuclear subs infiltrated deep into what were considered "enemy" waters. One Holystone submarine, for example, slipped into Vladivostok harbor and tapped underwater telephone cables carrying traffic between that Pacific port and Moscow. Other Holystone missions have infiltrated harbors of the Peoples Republic of China, trailed Soviet submarines halfway around the world and monitored the Red navy on maneuvers, just as the Soviets have sent trawlers and submarines to observe NATO and U.S. Navy sea exercises.

The U.S. Navy has developed a vast underwater electronics system off American shores to warn against intruder submarines. This network of detection devices, also emplaced along other routes frequented by Soviet and Warsaw Pact ships and submarines, is linked to land stations by cable and warns of traffic passing through. Virtually all Soviet ships and submarines trail a distinct sonic "signature" in their wake that has been recorded by underwater sentries and filed on computer tapes for instant recall, if necessary.

Sharp-eyed satellites

As operations on land, at sea and in the skies became increasingly risky, American scientists and engineers were forced to develop advanced satellites that could see, hear and "sense" what was happening on terra firma. Once or twice a month, a secret Discoverer or Samos spy-in-the-sky satellite is launched from Vandenberg Air Force Base into a polar orbit to circle the globe every 90 minutes at altitudes of 86 to 114 miles, carrying cameras that can spot, on the Earth's surface, an object as small as a basketball.

Some years ago, U.S. spy satellites, after a number of passes over the Soviet Union and mainland China, would eject a package at a predetermined time and position over the Pacific. Air Force cargo planes equipped with skyhooks would snare the falling package as it slowly parachuted earthward. The package would be rushed to a nearby military base and its valuable film developed for analysis by photo interpreters.

Now all that is old hat. Satellites launched in the 1970s transmit telemetry that ground stations convert to videotape images, which can be projected or printed as high-resolution photos. "Sensing" satellites like the Vela and Midas spy satellites, orbiting at an altitude of 55,000 miles from Earth, pick up various signals: infrared (heat) rays given off by a blast furnace, a launched missile, a fleet of trucks, trains, ships and even crops; also concentrations of gamma rays, X-rays, neutrons and large electromagnetic fields—indications of nuclear-bomb fallout in the atmosphere.

Satellites have replaced the Distant Early Warning (DEW) Line and Ballistic Missile Early Warning System of the 1950s and 1960s—those football-field-sized masses of steel, wire mesh, cables and plastic domes along the Arctic Circle. Today, the United States has surveillance satellites that eavesdrop on transmissions throughout the world and relay voice and code messages back to Earth where high-speed computers take over and distill and file potential intelligence information.

Even crops are important

And then there are the NASA satellites that provide additional information required by military lead-

ers and State Department foreign policy makers. These "peaceful" satellites also provide valuable intelligence. Earth Resources Technology Satellites monitor such things as crops, forests, geological strata, ocean currents and channels.

This type of intelligence makes it impossible, for example, for the Soviets to hide a poor wheat harvest, giving the United States an advantage in bargaining with the Kremlin. New highways and railroad routes are passed on to the Pentagon; in the event of war, this is the type of information that the generals need to map their battle plans.

Improved maps

Maps are another very important factor in war as well as in peace. The Soviets continuously charge that U.S. geodetic satellites are performing a military intelligence function. As a matter of fact, they are. Intercontinental missiles are worthless if targets thousands of miles away are not pinpointed. Prior to the advent of satellite mapping, the cartographers of the previous 100 years had accurately mapped only a portion of the globe. Once the geodetic satellites were put to work, the locations of some cities in Siberia and the Peoples Republic of China were corrected by as much as 10 miles.

Monitoring Angolan action

Here are some other accomplishments of America's high-flying spies:

- Early this year satellites and U.S. destroyers tracked Soviet troopships and freighters that delivered Cuban soldiers and equipment to Angola.
- India's recent nuclear weapons experiments were monitored by satellites, and the birds have provided details about the power of the blasts and the degree of dirty fallout.
- Military flare-ups along isolated borders between the Soviet Union and China can no longer be kept under wraps and leaked by Peking or Moscow as they see fit. Satellites observe and eavesdrop, and this intelligence is received in Washington within a matter of hours. In the early 1960s, news of Sino-Soviet battles would be received weeks after the fact.
- Late last year satellites provided intelligence about new mobile ballistic missile launchers fielded by the Soviets and the keel laying of a fourth Red navy aircraft carrier.

Whether it's a new steel plant, truckbuilding complex, chemical factory or missile launching site, its existence can't be hidden from our orbiting snoopers. Though American surveillance is considered superior to that of the Soviets, it can be assumed Russian satellites also are effective.

Snooping in publications

Where does all this leave the traditional undercover agent? He still plays a role, but a diminished one. The Soviets, for example, maintain a large force of intelligence agents in the United States, in Washington and at the United Nations. Much of their spying consists of collecting everything published about economic, industrial, political and military developments in the United States. Occasionally, these agents attempt to ferret out more closely held information by subverting government employees.

But it's not like the good old days. "Science and technology have taken all the fun out of spying," says a former spook who worked behind enemy lines for the OSS in World War II and who recently retired from the CIA. "How do you complete with a computer or guard against esoteric equipment you can't see, much less understand? No wonder the CIA is retiring us real spies." ★★★