Puzzle of Molecular Forces Solved By Russian Scientists

New York, N. Y. – (Scientific American Feature) – The nature of the forces that bind the material world together, one of the long standing puzzles of science, has been solved by two Russians, Boris V. Derjaguin and Irene Abrikossova. Contrary to earlier explanations of these forces, which ascribed them variously to electrostatic phenomena and chemical interactions, the Russian scientists have found the basic cement of the material universe to be electromagnetic, essentially radio waves of incredibly short wave length.

"One of the first workers to see clearly the implications of electromagnetic theory at the level of the molecule," states Academician Derjaguin, "was the Russian physicist P. N. Lebedev, best known as the first experimenter to measure the pressure exerted by light. In 1896 he wrote with prophetic insight: 'Hertz's research into the interpretation of light waves as electromagnetic processes unveils another problem of a radiation source, of those processes which a molecular vibrator undergoes when it emits light energy to its surroundings. On the other hand this problem leads into the field of spectroscopic analysis. Almost entirely unexpectedly, it leads to one of the most complicated questions of modern physics, the science of molecular forces.'

Statement Ahead of Time

"Lebedev came as close to the latest views on the nature of molecular forces as was possible before the development of modern physics. But his statement, while ahead of its time, was very far from quantitative law. The first quantitative theories treated them as entirely electrostatic rather than electromagnetic.

"This was the unsatisfactory state of theoretical knowledge when Mrs. Abrikossova and I set out in 1951 to measure the molecular attraction between a pair of solid objects. No investigators had succeeded in making this measurement, principally because the molecular force falls to substantially zero when two objects are separated by more than about one thousandth of the diameter of a human hair. When they approach within this distance, however, the force mounts abruptly. With the help of Fanny Leib, a colleague at the Academy of Sciences in Moscow, however, we were able to design an apparatus that met the stringent, and in some ways contradictory, requirements of the job.

"In the first place, we were trying to measure a small force – as little a thirty-thousandth of an ounce. This in itself is not too difficult; microchemists routinely deal with far small forces. But in our problem the attraction to be measured shows up only when the two bodies are extremely close together. Furthermore, the force varies enormously as the distance of separation in changed. It is precisely this variation that we wanted to determine because this information would provide us with a clue to the nature of the force involved.

"The requirements of sensitivity, stability and rapid response are not easy to reconcile. A sensitive balance tends to swing widely in response to a small change in force. Our apparatus achieved these diverse aims by means of automatic control, a solution unavailable to scientific workers prior to the advent of modern electronic technology.

Mathematical Formula

"Inspired by our experimental work the theoretical physicist E. M. Lifshitz derived a methematical formula for the force of molecular attraction from very general principles. As soon as Lifshitz announced his results, we applied them to a calculation of the force between the bodies we had used in our experiments. The results, mathematical and experimental, matched and this agreement between theory and experiment is particularly convincing because the theory contains no undetermined constants; the comparison is absolute and applies successfully to the several materials we measured.

"Although our experiments verify the Lifshitz formulas only for the special case of large gaps they tend to support the whole theory. And so the electromagnetic nature of molecular forces and their relation to light spectra, so long ago postulated by Lebedev, have now been demonstrated. He would be glad to know that the attraction between molecules does not, as he feared, 'involve other forces whose source is still unknown.'"

Cancer Found To Be Contagious in Poultry Experiment

Washington (Science Service)—Cancer has been proved contagious for the first time.

Rous sarcoma, a virus-caused cancer found in chickens, can be transmitted from bird to bird by direct contact, Dr. B. R. Burmester of the U.S. Department of Agriculture's Regional Poultry Laboratory, East Lansing, Mich., has found.

Until now Rous sarcoma, which has been used in research for 50 years, was thought to be non-contagious. Studies to date suggest that similar virus-caused cancers may also prove contagious.

May Aid in Fighting

The new find not only lends weight to the belief of many scientists that viruses cause some forms of animal and human cancers, but also may aid in fighting these diseases.

The experiments that led to proof of the Rous sarcoma virus' contagious nature gave clear-cut results. Dr. Burmester inoculated a number of chickens with the virus, either under-the-skin injection or intravenous injection, placed these birds in the same pen with healthy chicks and raised them to maturity.

In one test, 35 to 45 healthy birds raised in direct contact with birds inoculated subcutaneously died of Rous sarcoma. Of 59 chickens reared in direct contact with 118 birds inoculated intravenously with a low dose of the virus, six developed tumors and died.

Virus taken from the tumors of contact-infected birds was found to be the same as the virus used by inoculation. The concentration of virus in tumors from contact-infected birds was directly proportional to the amount used to inoculate the chickens to which the contact-infected birds were exposed.

Tumors The Same

Under the microscope tumors from chickens infected artificially or by contact were the same.

In another experiment healthy chickens were put in the same cubicles with virus-inoculated chickens, but were separated by a wire-mesh screen. None of the healthy birds died with tumors. Direct contact is thus far superior to indirect contact for transmitting the virus. How the virus is transferred from bird to bird is still unknown, but a few facts have been established. Chickens made to breathe high virus doses in aerosol form did not develop tumors, but more than half developed tumors when the virus was artificially instilled in the nasal passages.

No tumors resulted when virus was placed under the chicken's tongue or when it was applied to a nonfeathered area of intact skin. But 80% developed tumors when the virus was rubbed into a skin scratch or on an area where immature feathers had been extracted. It has also been established that the virus can enter a bird's body through a feather follicle and cause local as well as internal tumors.

Masked Gunman Arrives Too Late

St. Louis — Carl Zimmerman, a service station owner, deposited his weekend receipts at a bank and walked onto the bank parking lot.

A masked, armed bandit jumped from behind a car and demanded money.

"Sorry, but I just deposited the money," Zimmerman said.

"Come on, hand it over," the bandit pleaded.

Zimmerman showed him the two empty money baks. The man was convinced. He ran to a waiting car driven by another masked man and escaped.

Pushbutton Directory Big Help to Shoppers

Norwalk, Calif.—Ever get that lost feeling in a self-service store? A California drug chain may have solved the problem—in Hi-Fi.

A new type of pushbutton directory has been installed in a store here.

Shoppers check the directory for the item they want, push the right button, and a recorded voice tells exactly where is is in the store.

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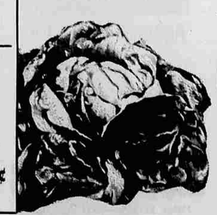

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Many Advances in Electronics Said Due To Lodestones

New York, N.Y.–(Scientific American Feature)– Many of the current advances in electronics that are responsible for improved TV reception, more effective computing machines, keener-eyed radar and accurately launched satellites owe their advent to the recent development of a family of magnetic materials closely related to lodestone, the first magnet known to man, according to C. Lester Hogan, former professor of applied physics at Harvard University.

Like the lodestone, Dr. Hogan explains, the new materials, which are called "ferrites," consist largely of rusty iron compacted and fired into lumps of desired size and shape. They are not nearly as strong magnetically, as the common horseshoe magnets used as playthings. But unlike magnets the ferrites function both as reasonably strong magnets and as highly effective electrical insulators.

Electromagnetism

Why is this combination so potent? "The answer," explains Dr. Hogan, "is implied in the word electromagnetism, which indicates how intimately the phenomena of electricity and magnetism are associated. On the one hand, the association is responsible for almost every useful application of electricity. On the other, its very intimacy eventually sets a limit to what can be done. It is by the partial isolation of electrical and magnetic effects that the magnetic oxides have pushed back the technological limits."

A great many electrical devices that operate on alternating currents, according to Dr. Hogan, depend for their functioning on so-called "electrical induction:" a current in one portion of a circuit causes a comparable current to flow in a second circuit. The current flowing in the stationary part of an electric motor, for example, induces a current in the part of the motor that rotates and it is the reaction of this induced current that causes the motor to turn. The medium responsible for the transfer is a magnetic field generated by current flowing in the first circuit. The *strength of the field is greatly enhanced if the two parts of the circuit are linked by a* magnetic material, such as an iron core. Unfortunately, such cores also act as conductors of electric current and a wasteful current is induced in the iron as well as in the second circuit where it is wanted. The amount of the waste varies in proportion to the frequency at which current alternates. The waste is not important in the range of low frequencies (60 cycles per second) at which electric power is distributed. But at the multi-million cycle frequencies of television and radar most of the energy would be lost in cores of ordinary iron.

Cores Assembled

To overcome this problem scientists in recent years have learned how to assemble magnetic cores on the sub-microscopic level of the molecule. Atoms of iron, along with a few of nickle and certain other elements, are deliberately sandwiched between atoms of oxygen according to a prearranged pattern. The combination is thus impure iron oxide, or "rust," and does not differ greatly from ancient lodestone. In effect, the oxygen atoms act like insulators. Their presence diminishes the magnetic effectiveness of the iron somewhat but this is more than compensated by the fact that wasteful currents cannot flow in the material. Many atomic combinations have been developed for specific electronic applications, according to Dr. Hogan, some of them verging on the exotic. one kind, for example, takes the form of garnet.

"The small size of today's radios is as much a product of these new ferrites as of other miniaturization techniques," says Dr. Hogan. "Every modern television receiver contains ferrite cores as do the most effective radars and other microwave equipment. The ferrites are also being used extensively in large digital computers as 'memory' units, in the form of tiny cores in which information is stored magnetically. Today designers are hard at work finding new ways in which to capitalize on the remarkable properties of ferrites. Among the more promising ideas is one for an amplifier that will have substantially no noise and hence can boost the weak signals from outer space to practical levels. The field is still so new and so fertile that we can merely guess at the harvest it may eventually yield."

Cigar Industry Worrying About Havana Supply

New York –(UPI)– The American cigar industry is worrying about its supply of clear Havana tobacco.

The growing bitterness between Washington and Premier Fidel Castro of Cuba could cut the tobacco supply supply off overnight. And in a few weeks, several million American cigar lovers would be reduced to smoking cheap domestic stogies exclusively.

A spokesman for the Cigar Manufacturers association said this possibility really has been causing his members some sleepless nights.

"All our finest wrapper and filler tobacco is Cuban," he said, "and we don't know where we could replace the supply. Sumatra used to produce good cigar tobacco, but since the Dutch left Indonesia, it is being neglected. Other Latin-American countries with conditibns somewhat like Cuba's, particularly Brazil and Peru, might produce good cigar tobacco, but it would take time."

The United States takes 40 per cent of Cuba's tobacco exports and Spain is Cuba's next best customer, according to the cigarmakers association.

U.S. imports of Cuban tobacco last year were 30.46 million pounds worth $27.89 million at wholesale. A small part of this was cigarette blending tobacco, all the rest cigar wrapper and filler. In addition, we imported 23.5 million finished cigars from Cuba, worth about $2.5 million at wholesale.

The Cigar Manufacturers association said it had heard of no move in the United States to put a higher tariff on Cuban tobacco or to curtail imports on tobacco specifically in retaliation for the Castro regime's unilateral seizure of American property and businesses without any realistic proposals for compensation.

What the cigarmakers fear is a total collapse of political and economic relations between Washington and Cuba that will make it impossible for them to buy Havana tobacco.

Million Dollar Motel Scheduled

Portland –(UPI)– The Portland owners of the M. Sellers Building announced plans Wednesday to convert the 50-year-old downtown building to a million dollar motel.

Simon Director, president of the Oregon Investment Co., said financial details of the development are in progress. Architects have begun preliminary plans on the proposed 100 room hotel across the street from the Multnomah hotel, he said.

The firm purchased the six-story structure earlier this year for $175,000.

Construction will probably begin late next year, Director indicated.

Assault Charged To Portland Man

Portland —(UPI)— Walter M. Miller, 41-year-old Portland restaurant operator, was charged with assault with a deadly weapon Wednesday in connection with the shooting of two Portland sisters Wednesday morning.

Wounded in the shooting were Mrs. Wilma Jackson, 41, and Mrs. Lula Parker, 43. Both were listed in satisfactory condition at Emanuel hospital.

Police said the shooting apparently climaxed a business argument.

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