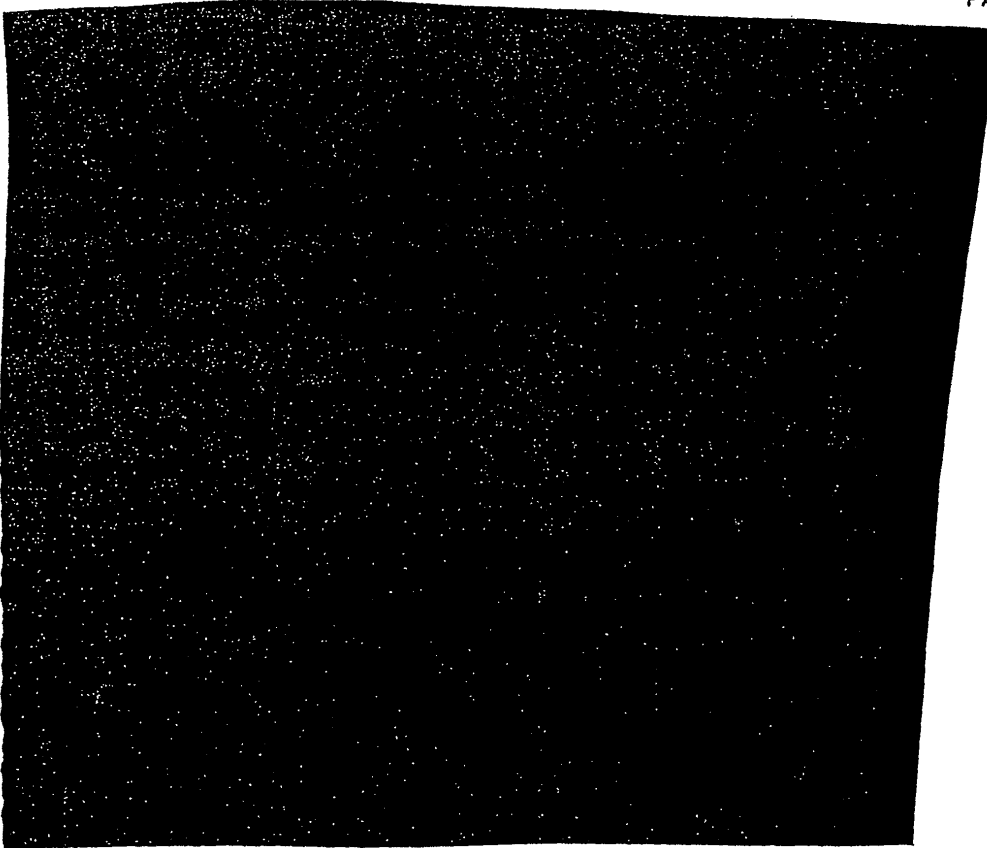


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13 MARCH 1986.

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KEY JUDGMENTS: SOVIET LASER CHEMISTRY RESEARCH AND APPLICATIONS [REDACTED]

SINCE THE EARLY 1960S THE SOVIETS HAVE PIONEERED THE FIELD OF LASER CHEMISTRY IN WHICH A LASER IS USED TO INFLUENCE OR DIRECT A CHEMICAL REACTION. TWENTY YEARS OF CONTINUOUS RESEARCH HAS GIVEN THE SOVIETS SCIENTIFIC RECOGNITION AS WORLD LEADERS IN THIS SCIENCE AND A TECHNOLOGICAL BASE FOR DEVELOPING SIGNIFICANT INDUSTRIAL APPLICATIONS IN ELECTRONICS, CHEMICAL ENGINEERING, PROCESS CONTROL, AND GENETIC ENGINEERING. [REDACTED]

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1. KEY JUDGMENTS: SOVIET LASER CHEMISTRY RESEARCH AND APPLICATIONS [REDACTED]

THE FOLLOWING KEY JUDGMENTS ARE REPRINTED FROM A

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RECENTLY PUBLISHED SCIENTIFIC AND TECHNICAL  
INTELLIGENCE REPORT PRODUCED BY THE OFFICE OF  
SCIENTIFIC AND WEAPONS RESEARCH.

[REDACTED]

WE BELIEVE SOVIET BASIC RESEARCH IN LASER CHEMISTRY IS EQUAL  
TO OR AHEAD OF US RESEARCH IN MOST AREAS. OUR JUDGMENT IS  
FORMED PRIMARILY FROM ANALYSIS OF OPEN-LITERATURE PUBLICATIONS  
BY SOVIET SCIENTISTS [REDACTED]

[REDACTED] LASER CHEMISTRY IS A TECHNOLOGICAL  
BASE FOR THE DEVELOPMENT OF NUCLEAR POWER AND WEAPONS,  
ELECTRONICS, CHEMICAL ENGINEERING, PROCESS CONTROL, AND  
GENETIC ENGINEERING. [REDACTED]

IN LASER CHEMISTRY, LASER LIGHT IS USED TO PROMOTE CHANGES IN  
THE PHYSICAL OR CHEMICAL PROPERTIES OF MATTER. THESE CHANGES  
CAN PRODUCE NEW CHEMICAL COMPOUNDS, HIGHER YIELDS IN PROCESSES  
FOR MAKING CONVENTIONAL COMPOUNDS, OR COMPOUNDS WITH  
PROPERTIES NOT EASILY OBTAINED THROUGH CONVENTIONAL CHEMISTRY.  
LASER CHEMISTRY CAN ALSO BE USED TO SEPARATE VERY SIMILAR  
ATOMS OR MOLECULES AND TO DETECT THE PRESENCE OF THESE SPECIES  
IN EXTREMELY SMALL QUANTITIES. THE SOVIETS HAVE PERFORMED  
EXTENSIVE RESEARCH IN ALL FIELDS OF LASER CHEMISTRY. [REDACTED]

ALTHOUGH THE SOVIETS LEAD THE UNITED STATES IN MANY AREAS OF  
BASIC RESEARCH, THEY HAVE BEEN SURPASSED BY THE UNITED STATES  
IN THE INDUSTRIALIZATION OF APPLICATIONS OFFERING THE GREATEST  
NEAR TERM ECONOMIC POTENTIAL. WE BELIEVE THAT THE SOVIETS  
HAVE LAGGED BEHIND THE UNITED STATES IN INDUSTRIALIZATION  
PRIMARILY BECAUSE OF A LACK OF COOPERATION BETWEEN SOVIET  
BASIC RESEARCH INSTITUTES AND INDUSTRY--NOT BECAUSE THE  
SOVIETS ARE TECHNICALLY LIMITED IN THEIR ABILITY TO APPLY  
ADVANCES FROM BASIC RESEARCH. THE SOVIETS, HOWEVER, HAVE NOW  
ESTABLISHED A WELL-DEFINED, GOAL-ORIENTED PROGRAM, WHOSE  
INITIAL SUCCESS COULD GREATLY INCREASE THE RATE OF  
INCORPORATION OF BASIC SOVIET LASER CHEMISTRY RESEARCH INTO  
INDUSTRY. IF THIS PROGRAM IS SUCCESSFUL, THE SOVIETS COULD  
IMPROVE THE DEVELOPMENT OF APPLICATIONS BY 1995. [REDACTED]

LASER CHEMISTRY AS APPLIED TO ISOTOPE SEPARATION PROMISES TO  
BE A MORE EFFICIENT AND ECONOMICAL WAY OF SEPARATING OR  
ENRICHING MANY NUCLEAR ISOTOPES--IMPORTANT IN BASIC RESEARCH,  
MEDICAL RESEARCH, NUCLEAR POWER, AND NUCLEAR WEAPONS. THE  
SOVIETS LEAD THE WEST IN THE BASIC RESEARCH OF LASER ISOTOPE  
SEPARATION (LIS). THEY HAVE BUILT THE WORLD'S FIRST TWO PILOT  
PLANTS FOR THE SEPARATION OF LIGHT ISOTOPES, AND WE BELIEVE  
THEY ARE NOW CAPABLE OF OPERATING THESE PLANTS AND INDUSTRIAL-  
LEVEL SEPARATION PLANTS FOR LIGHT ATOMS AND LOW MOLECULAR  
WEIGHT MOLECULES. THEIR RESEARCH, HOWEVER, MAY NOT BE AS  
APPLICABLE TO THE SEPARATION OF URANIUM AND PLUTONIUM ISOTOPES  
AS THAT PURSUED IN THE UNITED STATES. IN OUR JUDGMENT, THEY  
WILL NOT BE ABLE TO OPERATE AN INDUSTRIAL PLANT FOR THE  
ENRICHMENT OF URANIUM BEFORE THE YEAR 2000. [REDACTED]

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THE SOVIETS, ACCORDING TO OPEN SOURCES, HAVE PROPOSED USING LASER ISOTOPE SEPARATION TO PRODUCE HIGH PURITY CARBON-13. A POTENTIAL APPLICATION FOR LARGE QUANTITIES OF CARBON-13 IS FOR USE IN CARBON-DIOXIDE LASER WEAPONS. THE SOVIETS, ACCORDING TO A SCIENTIFIC PUBLICATION, ARE AWARE OF THE ADVANTAGES OF CARBON-13 AND MAY BE MOTIVATED TO DEVELOP A CARBON-13 LIS PROCESS TO MEET MILITARY OBJECTIVES. [REDACTED]

LASER CHEMISTRY AS APPLIED TO ULTRAPURIFICATION IS USED TO REMOVE TRACE IMPURITIES FROM A BULK MATERIAL. WHEN APPLIED TO MATERIALS WHERE HIGH PURITY IS REQUIRED, SUCH AS SEMICONDUCTORS OR PHARMACEUTICALS, IT CAN DRAMATICALLY INCREASE THE VALUE OF THE MATERIAL. THE SOVIETS LEAD THE WEST IN THIS TYPE OF BASIC RESEARCH. USING LASER PURIFICATION, THEY HAVE DEVELOPED HIGH-QUALITY ELECTRONICS-GRADE SEMICONDUCTOR MATERIALS IN ORDER TO REDUCE A PRESENT SHORTAGE OF THESE MATERIALS. WE BELIEVE THAT BY 1990 THE SOVIETS COULD OPERATE A PILOT PLANT. [REDACTED]

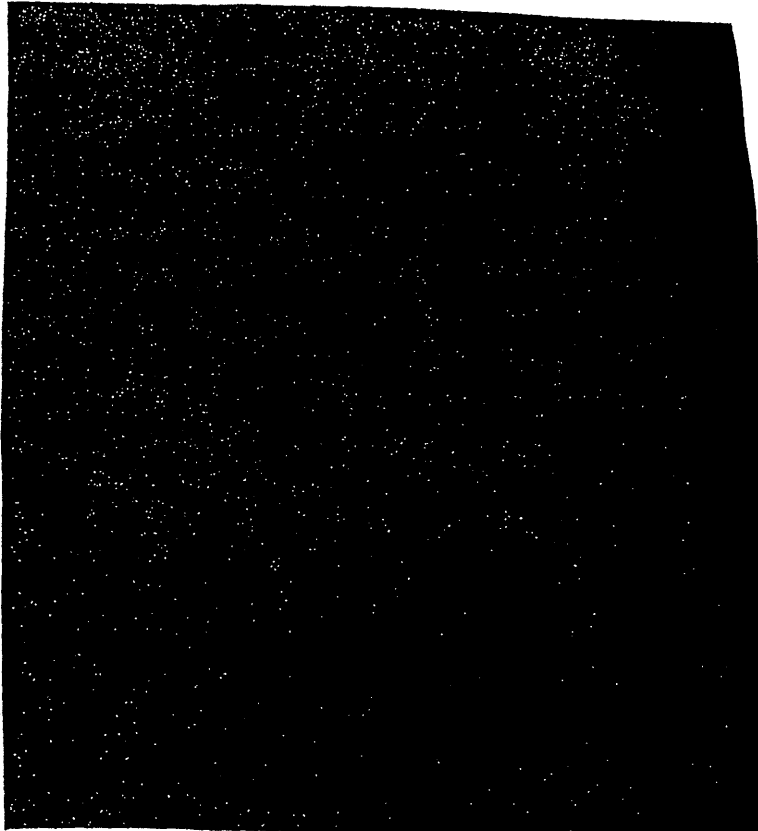
LASER CHEMICAL SYNTHESIS OFFERS GREATER CONTROL OVER THE CHEMICAL REACTION PATHS AND PRODUCTS THAN CONVENTIONAL

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CHEMISTRY. IT THUS HAS POTENTIAL TO PRODUCE UNIQUE COMPOUNDS, TO INCREASE THE SELECTIVITY AND YIELDS OF INDUSTRIAL REACTIONS, AND TO PERFORM CONTROLLED CHEMICAL REACTIONS ON SURFACES AND IN LIVING ORGANISMS. THE SOVIETS LEAD IN THE BASIC RESEARCH OF LASER CHEMICAL SYNTHESIS, AND WE BELIEVE THEY WILL ESTABLISH A PILOT PLANT FOR LASER-INDUCED CHEMICAL SYNTHESIS BY 1995. [REDACTED]

LASER SURFACE CHEMISTRY IS IMPORTANT IN THE PRODUCTION OF ADVANCED MICROELECTRONIC COMPONENTS AND THE COATING OF ADVANCED MATERIALS. SOVIET LASER SURFACE CHEMISTRY RESEARCH IS PURSUING CONCEPTS EQUAL TO OR MORE ADVANCED THAN THOSE IN THE WEST. THIS BASIC RESEARCH, HOWEVER, OFTEN HAS POINTED TOARD APPLICATIONS THAT ARE TOO ADVANCED TO OFFER SOVIET INDUSTRY PRACTICAL SOLUTIONS TO EXISTING PROBLEMS. AS THE SOVIET ELECTRONICS INDUSTRY DEVELOPS IN THE COMING DECADE, HOWEVER, WE BELIEVE LASER SURFACE CHEMISTRY WILL PLAY A MORE

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SIGNIFICANT ROLE. [REDACTED]  
 ONE AREA OF LASER PHOTOCHEMISTRY IN WHICH THE SOVIETS MAINTAIN A SIGNIFICANT LEAD IN BOTH BASIC AND APPLIED RESEARCH IS LASER PHOTOBIOLOGY, POTENTIALLY USEFUL IN GENETIC ENGINEERING AND BIOLOGICAL WARFARE RESEARCH. THIS EFFORT IS WELL ORGANIZED WITH PHYSICISTS, CHEMISTS, BIOLOGISTS, AND MEDICAL DOCTORS WORKING JOINTLY IN THE RESEARCH. THE SOVIETS HAVE ACHIEVED SELECTIVE LASER CHEMISTRY RESULTS ON BIOLOGICAL MOLECULES AND HAVE MUTATED BACTERIA AND VIRUSES SELECTIVELY. [REDACTED]  
 THE SELECTIVITY OF LASER CHEMISTRY PROVIDES A HIGHLY SENSITIVE METHOD FOR DETECTING AND MEASURING TRACE QUANTITIES OF ATOMS OR MOLECULES. IT HAS A WIDE RANGE OF APPLICATIONS FROM PROCESS AND QUALITY CONTROL IN INDUSTRY TO THE DETECTION OF POLLUTANTS OR CHEMICAL WEAPONS IN THE ATMOSPHERE. THE SOVIETS, WHO LEAD IN THE BASIC RESEARCH OF LASER ANALYTICAL CHEMISTRY, ARE PLACING SPECIAL EMPHASIS ON THOSE APPLICATIONS THAT IMPROVE BOTH THE PROCESS CONTROL AND AUTOMATION OF THE SEMICONDUCTOR INDUSTRY. [REDACTED]

COMPARISON OF SOVIET AND US ACHIEVEMENTS  
 IN LASER CHEMISTRY

RESEARCH AREA	BASIC RESEARCH	APPLIED RESEARCH	PILOT PLANTS	INDUSTRIAL PLANTS
LIGHT ISOTOPE SEPARATION	USSR GREATER THAN US	USSR GREATER THAN US	USSR GREATER THAN US	USSR GREATER THAN US
URANIUM/PLUTONIUM SEPARATION	USSR US EQUALS	USSR GREATER THAN USSR	USSR GREATER THAN USSR	NONE
ULTRAPURIFICATION	USSR GREATER THAN US	US GREATER THAN USSR	US GREATER THAN USSR	US GREATER THAN USSR
DIRECT PHOTOCHEMISTRY	USSR GREATER THAN US	US GREATER THAN USSR	US GREATER THAN USSR	NONE
LASER-INDUCED CHEMISTRY	USSR US EQUALS	US EQUALS	US EQUALS	NONE
LASER SURFACE CHEMISTRY	USSR GREATER THAN US	USSR GREATER THAN US	US GREATER THAN USSR	US GREATER THAN USSR
LASER PHOTOBIOLOGY	USSR GREATER THAN US	USSR GREATER THAN US	USSR GREATER THAN US	NONE
LASER ANALYTICAL CHEMISTRY	USSR GREATER THAN US	USSR GREATER THAN US	US EQUALS USSR	US GREATER THAN USSR

[REDACTED]

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