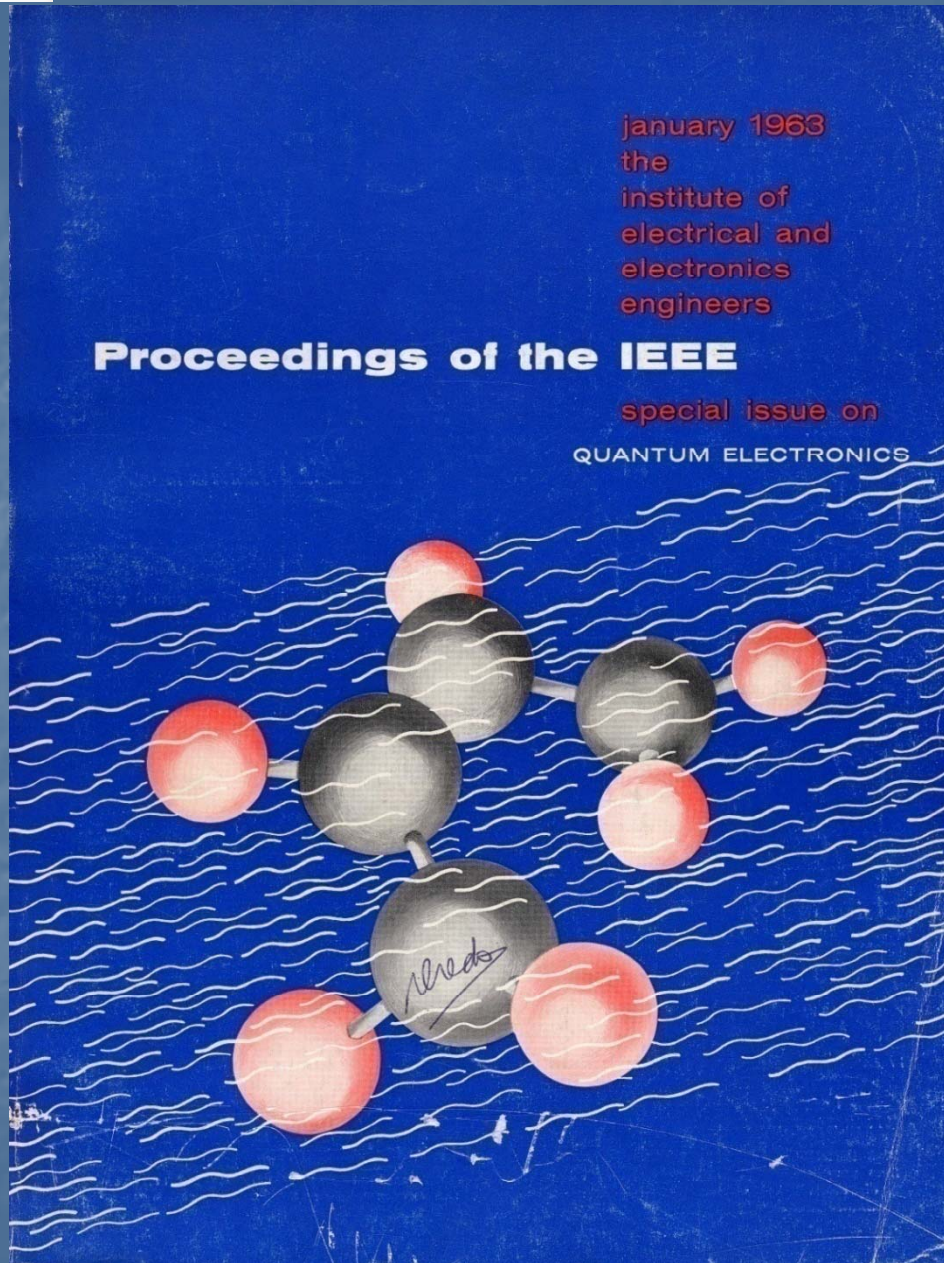
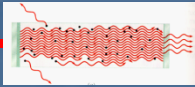


ALBORADA DEL FOTÓN

J.A. Martín Pereda

*Universidad Politécnica de Cataluña
4 de noviembre, 2009*



Primer número de los
“*Proceedings of the IEEE*”,
en enero de 1963.



Death Ray Machine Is Invented by Cleveland Scientist

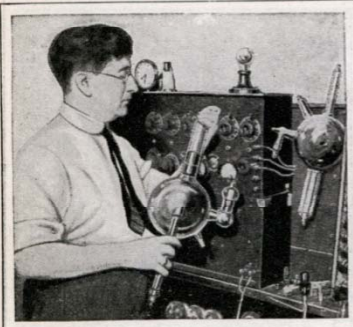


Photo shows Cleveland inventor in his laboratory with death ray machine in early stages of development. This machine is said to have proven successful in practice.

REPOR TED to have tremendous military possibilities, a successful death ray machine is said to have been invented, after lengthy experiments, by a Cleveland scientist.

A partial description of the machine's construction and operating principles was recently offered at a session of the National Inventors' Congress at Omaha, Nebraska.

Privileged witnesses to demonstrations of the machine declared that experiments were successful to a startling degree. Dogs, cats and rabbits were killed instantly, their blood turning to water as the ray was turned upon them. It is reported that the machine has been suppressed by the government until such time as it may be needed as a defensive weapon.

Modern Mechanix
Sep, 1934

German Death Ray Pistol Stuns Animals at Mile Range



This death ray gun is said to be capable of stunning men or animals at one mile range. The queer magnesium pistol is being demonstrated in Paris by its German inventor.

AN ODD-LOOKING pistol firing a magnesium charge said to be capable of stunning men and animals a mile away is now being demonstrated in Paris. Its inventor, a German who was forced to flee from his native land, hopes to sell the idea to the French government.

Scientists believe the operation of the device is based upon the "thermit reaction" now used in certain welding operations. The reflector mounted on the barrel of the gun would concentrate the deadly heat rays, and protect the operator from the dazzling glare of exploding magnesium.

"Death Ray" May Outlaw War



Prof. Harry May and his "death ray" machine. He hopes it will make nations afraid to start future wars. It is on exhibition at a San Diego, Calif., exposition at this time.

A "DEATH RAY" machine is on exhibition at the California Pacific International Exposition being held at San Diego, Calif. It was invented by Prof. Harry May of London, England.

Prof. May feels that his new lethal weapon will be instrumental in outlawing war. He thinks that nations, knowing that such a weapon for quick destruction is available, will hesitate to attack each other.

Modern Mechanix
Oct, 1936

Inventor Hides Secret of "Death Ray"

PIGEONS on the wing instantly killed by death rays from a machine four miles away—that is the feat reputedly accomplished by a deadly apparatus developed by Dr. Antonio Longoria, of Cleveland, Ohio, who recently announced that he had deliberately destroyed the lethal machine for the good of humanity. The Cleveland inventor declared that he had stumbled on the deadly rays while experimenting in the treatment of cancer with high-frequency radiations. The action of the fatal rays, he declared, is painless and they work by changing the blood into a useless substance, much as light transforms silver salts in photographic processes. Before a group of scientists, it is reported, he once demonstrated that the radiations would kill



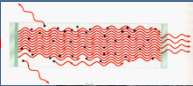
Dr. Antonio Longoria, who vows never to reveal his secret of the "death ray"

rats, mice, and rabbits, even when the animals were incased in a thick-walled metal chamber. The rays, Dr. Longoria believes, could kill human beings just as easily.

Modern Mechanix
Jan, 1935

TIME

Monday, Aug. 10,
1936





February 7, 1958
NUMBER 5105.15

Department of Defense Directive

SUBJECT Department of Defense Advanced Research Projects Agency

I. PURPOSE

The purpose of this directive is to provide within the Department of Defense an agency for the direction and performance of certain advanced research and development projects.

II. RESPONSIBILITY AND AUTHORITY

A. Establishment

In accordance with the provisions of the National Security Act of 1947, as amended, and Reorganization Plan No. 6 of 1953, there is established in the Office of the Secretary of Defense the Department of Defense Advanced Research Projects Agency. The Agency will be under the direction of the Director of Advanced Research Projects.

B. Responsibility

The Agency shall be responsible for the direction or performance of such advanced projects in the field of research and development as the Secretary of Defense shall, from time to time, designate by individual project or by category.

C. Authority

Subject to the direction and control of the Director:

1. The Agency is authorized to direct such research and development projects being performed within the Department of Defense as the Secretary of Defense may designate.
2. The Agency is authorized to arrange for the performance of research and development work by other agencies of Government, including the military departments, as may be necessary to accomplish its mission in relation to projects assigned.

3. The Agency is authorized to enter into contracts and agreements with individuals, private business entities, educational, research or scientific institutions including federal or state institutions.
4. The Agency is authorized to acquire or construct such research, development and test facilities and equipment as may be approved by the Secretary of Defense, in accordance with applicable statutes. However, existing facilities of the Department of Defense shall be utilized to the maximum extent practicable.

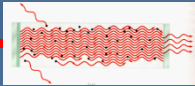
III. ORGANIZATION

- A. The Director of Advanced Research Projects shall report to the Secretary of Defense.
- B. The Department of Defense Advanced Research Projects Agency shall be provided such personnel and administrative support as may be approved by the Secretary of Defense.
- C. Other officers and agencies of the Office of the Secretary of Defense within their respective areas of responsibility shall provide support to the Director of the Advanced Research Projects Agency as may be necessary for him to carry out his assigned functions.

IV. EFFECTIVE DATE

This directive is effective immediately.

James D. Terry



May 11, 1951

Apparatus for obtaining about an increase
from excited atomic or molecular systems

Small hole for obtaining useful radiation

Magnetic field, energy obtained by induction

Exc. beam trap on bottom

Cavity

Output guide

Ground or cavity walls shifted by magnetic or electric fields to maintain resonance

Into the above cavity a stream of molecules flow which may exist in either low energy or high energy state. In the former one of these states will be reflected away by a special molecular beam refrigerator. Molecules in the latter state may exist in the beam but on exit of such refrigerator molecules at the excited excited state which is already shifted by "spontaneous" emission, but if energy is supplied into cavity, and the cavity is fairly "flat" the π transition thermal field in the cavity will have been increased slightly, this makes a small amount of molecules more probable. The field is gradually built up as more molecules are induced into the excited state. Molecules entering the cavity are made to oscillate and molecules emerge from cavity half in ground state & half in excited state. Oscillations will occur if there is any loss then the power delivered by excited molecules. Rough calculations show that power of approx. 10^{-6} watts might be obtained at frequency of 500 "cycles" per cm. wavelength. This system has the advantage of not being made of any material other than metal. Ground level molecules can be pumped and can be quite large by an external magnetic field. Pumping will be provided by molecules in the excited state. Molecules could be made to oscillate with all other atoms. The method is suitable for use in place of the usual maser.

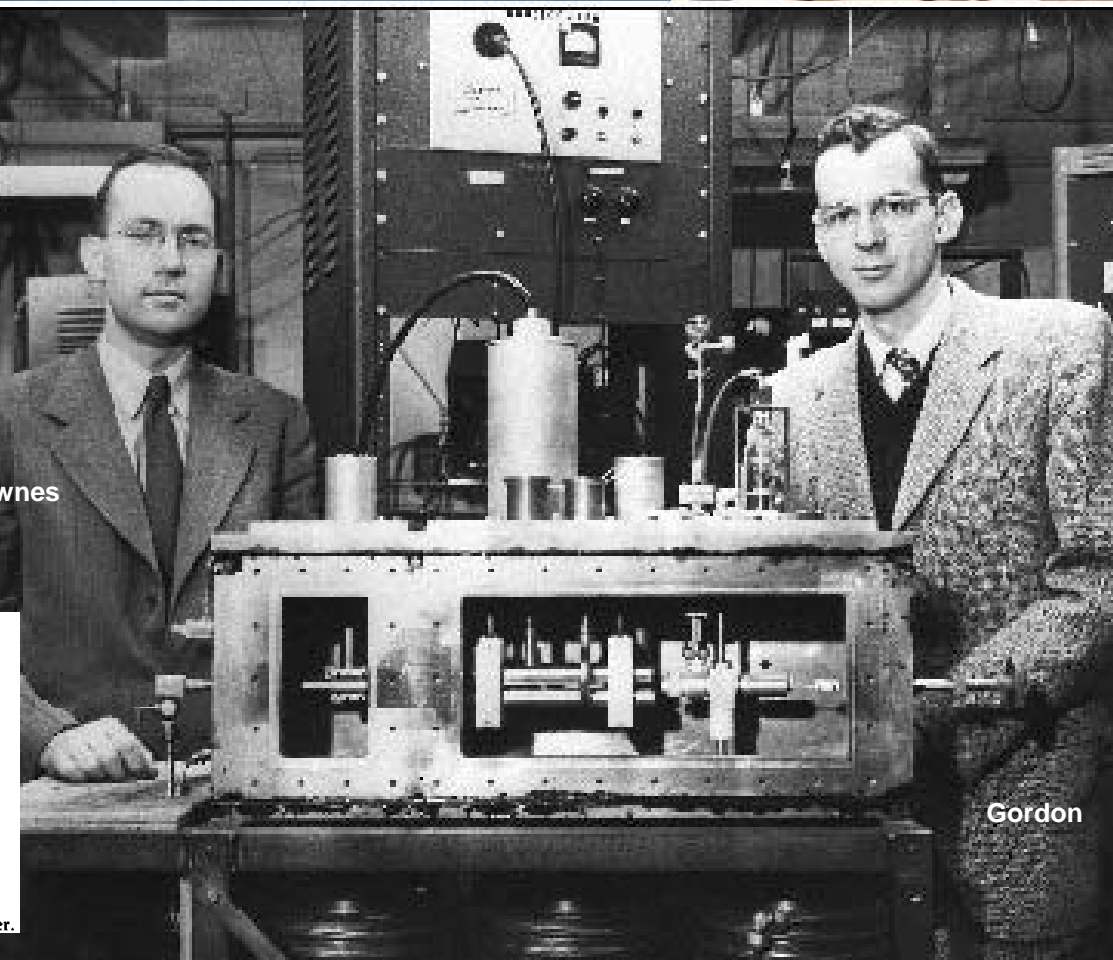
This paper was received from me on April 26, 1951. in Franklin Park, New Jersey. It was sent to Prof. L. Brillouin the same day and on May 1 to A. Brillouin. It was published in the Journal of Chemical Physics, Vol. 19, p. 105, May 1951. O. S. Scherer and H. S. G. Mason, Cornell University, Ithaca, New York, May 11, 1951. Chas. N. Townes

Página del libro de notas de C.H. Townes, en el que se recoge la idea original del **máser** (11 de mayo de 1951)

Townes en una conferencia de la Optical Society of America, en 1981, Washington, D.C

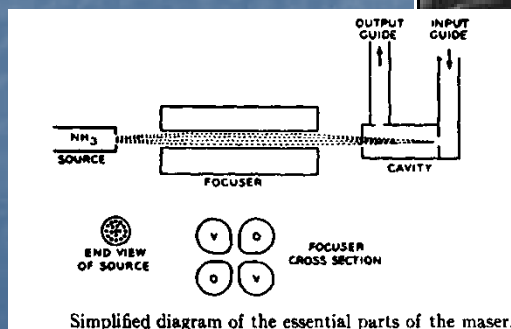


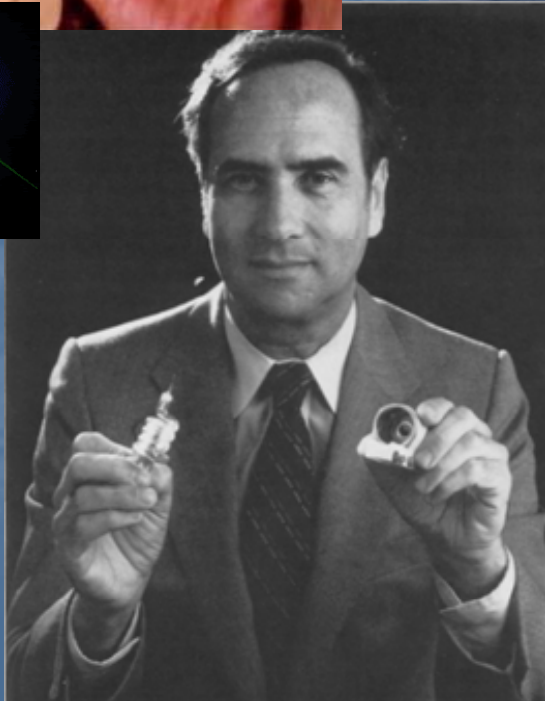
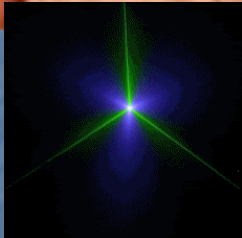
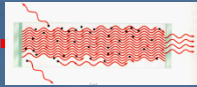
Townes



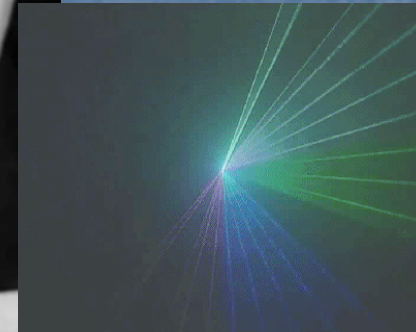
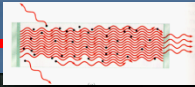
Townes

Gordon

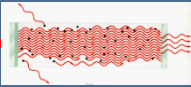




Maiman con el primer láser de rubí



Maiman con el primer láser falso de rubí



Stimulated Optical Radiation in Ruby

Schawlow and Townes¹ have proposed a technique for the generation of very monochromatic radiation in the infra-red optical region of the spectrum using alkali vapour as the active medium. Javan² and Sanders³ have discussed proposals involving electron-excited gaseous systems. In this laboratory an optical pumping technique has been successfully applied to a fluorescent solid resulting in the attainment of negative temperatures and stimulated optical emission at a wave-length of 6943 Å.; the active material used was ruby (chromium in corundum).

A simplified energy-level diagram for triply ionized chromium in this crystal is shown in Fig. 1. When this material is irradiated with energy at a wave-length of about 5500 Å., chromium ions are excited to the ⁴F₂ state and then quickly lose some of their excitation energy through non-radiative transitions to the ²E state⁴. This state then slowly decays by spontaneously emitting a sharp doublet the components of which at 300° K. are at 6943 Å. and 6929 Å. (Fig. 2a). Under very intense excitation the population of this metastable state (²E) can become greater than that of the ground-state; this is the condition for negative temperatures and consequently amplification via stimulated emission.

To demonstrate the above effect a ruby crystal of 1-cm. dimensions coated on two parallel faces with silver was irradiated by a high-power flash lamp;

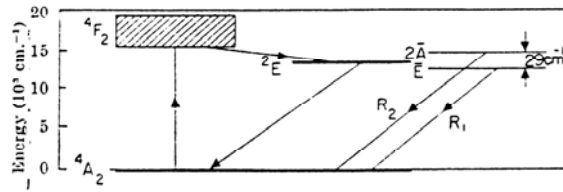


Fig. 1. Energy-level diagram of Cr²⁺ in corundum, showing pertinent processes

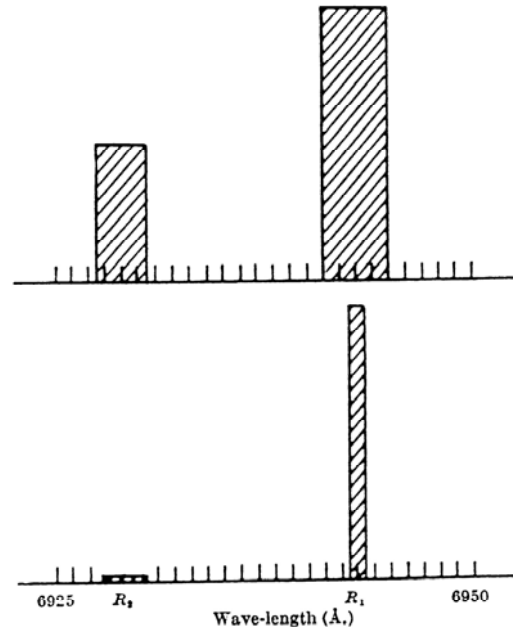


Fig. 2. Emission spectrum of ruby: a, low-power excitation; b, high-power excitation

the emission spectrum obtained under these conditions is shown in Fig. 2b. These results can be explained on the basis that negative temperatures were produced and regenerative amplification ensued. I expect, in principle, a considerably greater (~ 10⁸) reduction in line width when mode selection techniques are used¹.

I gratefully acknowledge helpful discussions with G. Birnbaum, R. W. Hellwarth, L. C. Levitt, and R. A. Satten and am indebted to I. J. D'Haenens and C. K. Asawa for technical assistance in obtaining the measurements.

T. H. MAIMAN

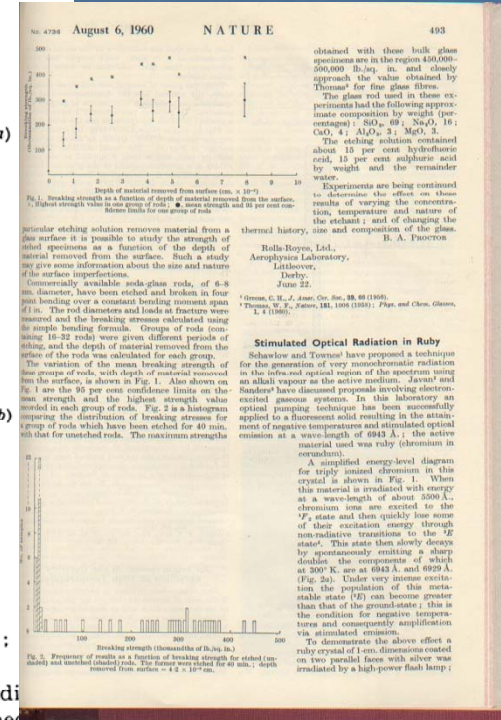
Hughes Research Laboratories,
A Division of Hughes Aircraft Co.,
Malibu, California.

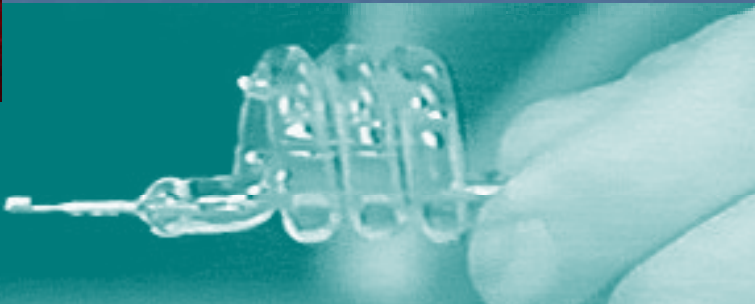
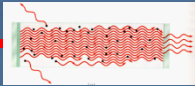
¹ Schawlow, A. L., and Townes, C. H., *Phys. Rev.*, 112, 1940 (1958).

² Javan, A., *Phys. Rev. Letters*, 3, 87 (1959).

³ Sanders, J. H., *Phys. Rev. Letters*, 3, 86 (1959).

⁴ Maiman, T. H., *Phys. Rev. Letters*, 4, 564 (1960).





Electronic News®
THE INDUSTRY'S WEEKLY NEWSPAPER • A FAIRCHILD PUBLICATION

Vol. 5, Whole No. 22 • NEW YORK, N. Y., MONDAY, OCTOBER 12, 1968 • TEN CENTS • No. 104 91

Today's Index
Communications ... 17-19
Components ... 20-21
Defense Electronics ... 21
Financial ... 22-23
General News ... 23-25, 47
Government Procurement ... 26
Instruments and Controls ... 28-29
Materials ... 29-31

ComLogNet May Include Griffiss AFB
By HELEN VITA, STAFF WRITER in Electronic News
BIRMINGHAM, N. Y.—Griffiss AFB may become one of the national military centers for the proposed multi-million dollar combat log network, but which Defense Electronics Co. is now considering.

A spokesman of the Rome base and 150 "center point" long-range planning (CRP) is currently planning to one of the five additional military centers for the network of 20,000 to 30,000 and the primary operation of this system.

As reported in these columns last week, Western Union will lease and operate a network of 20,000 to 30,000 and the primary operation of this system and including other major communications centers will be required to total some \$20 million. See CONTROL, Page 12.

Westinghouse Unveils SiC Transistor
Special to Electronic News
PITTSBURGH, Pa.—A silicon carbide transistor and is to be made of silicon carbide (SiC) was announced by Westinghouse Electric Corp. earlier in the week.

Further details of the Electronic Society meeting appear on Page 22.

Cost of NEAR System Put at \$40-50 Million
Special to Electronic News
CHICAGO.—Total cost of a National Emergency Alarm Repeater (NEAR) system was estimated at between \$40 million and \$50 million in a paper delivered last week at the Fall General Meeting of the American Institute of Electrical Engineers.

The speaker, H. L. Brock, Midwest, Western Institute, Kansas City, Mo., also stated that the cost of the NEAR system will probably be about \$100 million a unit.

The whole installation, he said, is about equal to the cost of a single major radar system in the Strategic Weapons System.

The paper, which was part of the Thursday afternoon Transactions, Distribution and Sales Seminar, was presented at the meeting of the Chicago meeting, a total of 1,500 registrants and registrants registered.

Operative on 100 rpm.

The NEAR system works on 100 rpm, 50, Brock said. Other systems require moderate speed generators and complex transmission systems. The NEAR system generator, consists both of these features, he said.

The system was developed by Midwest Research, made contact with the office of Civil Defense Administration. The original contract operative was to provide an advisory study for a production area.

Approximate \$100M. Figure. See NEWS, Page 4.

CORNING GLASS RESISTORS
Order now from your Corning distributor.
Have them within an hour.
Complete SIKKA FACILITY gives you small quantity orders for prototype or pilot runs.
The full name of your nearest Corning distributor will be on at 206, Pleasantville, N. J.

F. R. B. DISTRIBUTOR DIVISION

Hughes Studies Optical Radar as First Laser Use
By ALEXANDER C. TAKSON and RUSSELL J. BALEY
Special to Electronic News
BOULDER.—An optical radar set is being investigated by Hughes Aircraft Co., Culver City, Cal., as the first application of the optical radar.

This was disclosed by T. H. Melman of Hughes Research Laboratories, at a private briefing session before he delivered the paper on advanced radar systems to the annual meeting of the Optical Society of America last Tuesday.

Dr. Melman has mentioned an operating optical radar system at Hughes which was reported in these columns July 11.

He said this is a radar application for the pulsed optical energy whose beam of coherent light and narrow bandwidth, 6.7-10.2 degrees spread, is 100 milliwatts that is in effect, the coherent beam would only have a spread of about 200 feet.

The main emphasis of Hughes optical radar systems, others who are investigating the device have stated. See OPTICAL, Page 18.

Control Units Seen Focus of Europe Parley
By MICHAEL SHERIDAN
Special to Electronic News
BERLIN.—Control and monitoring devices for manufacturing and process industries are expected to lead the spotlight during the Second International Industrialization and Automation Congress and Exhibition (SIAE) which opens here Wednesday and continues through Oct. 26.

Control and monitoring devices for manufacturing and process industries are expected to lead the spotlight during the Second International Industrialization and Automation Congress and Exhibition (SIAE) which opens here Wednesday and continues through Oct. 26.

Midwest Apathy Hit At Chicago Conclave
By GEORGE M. DEARKE and NAT SYDENHAM
Special to Electronic News
CHICAGO.—The Midwest was flayed here last week in an ongoing work in electronics, for the lack of recognition by industry, as far as the wrong psychological climate for creative work.

In some cases, bland academic language was discarded while the flaying was administered.

Dr. Frederick C. Thompson, vice president and general of Standard Electronics, Stamford, Conn., said that the Wednesday afternoon luncheon at the Hotel Sherman.

The Midwest electronics 1968 See NEWS, Page 4.

Research Held Key to Growth On Long Island
By ED NAXOS
Special to Electronic News
WESTHURST, L. I., N. Y.—The Long Island electronics industry may help an important research and development program that will be developed through the participation of Federal Contractors & Suppliers, Corp., Great Neck, L. I., and other local firms.

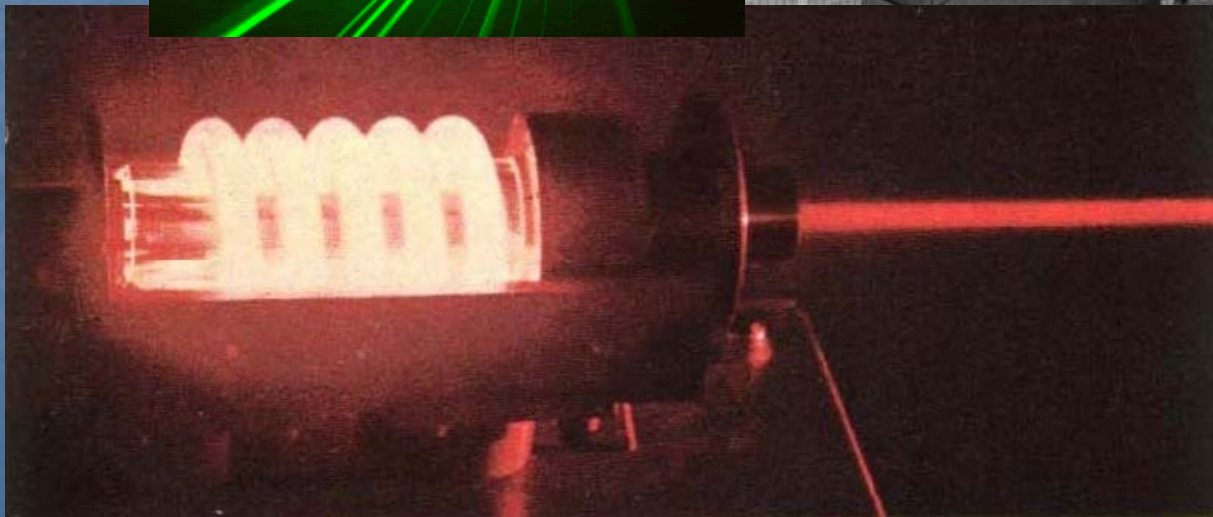
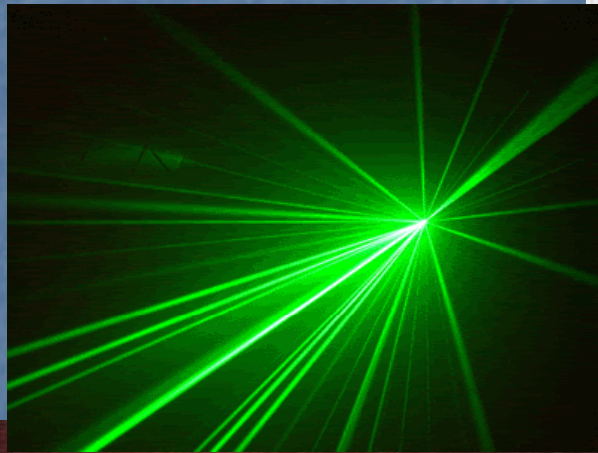
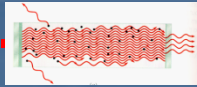
Mr. Charles one of a 10-member panel of speakers at the Long Island Electronics Manufacturers Council, said that his firm could not compete with "massive" labor available in other parts of the country, and that he would not continue to have more of his staff.

See RESEARCH, Page 16.

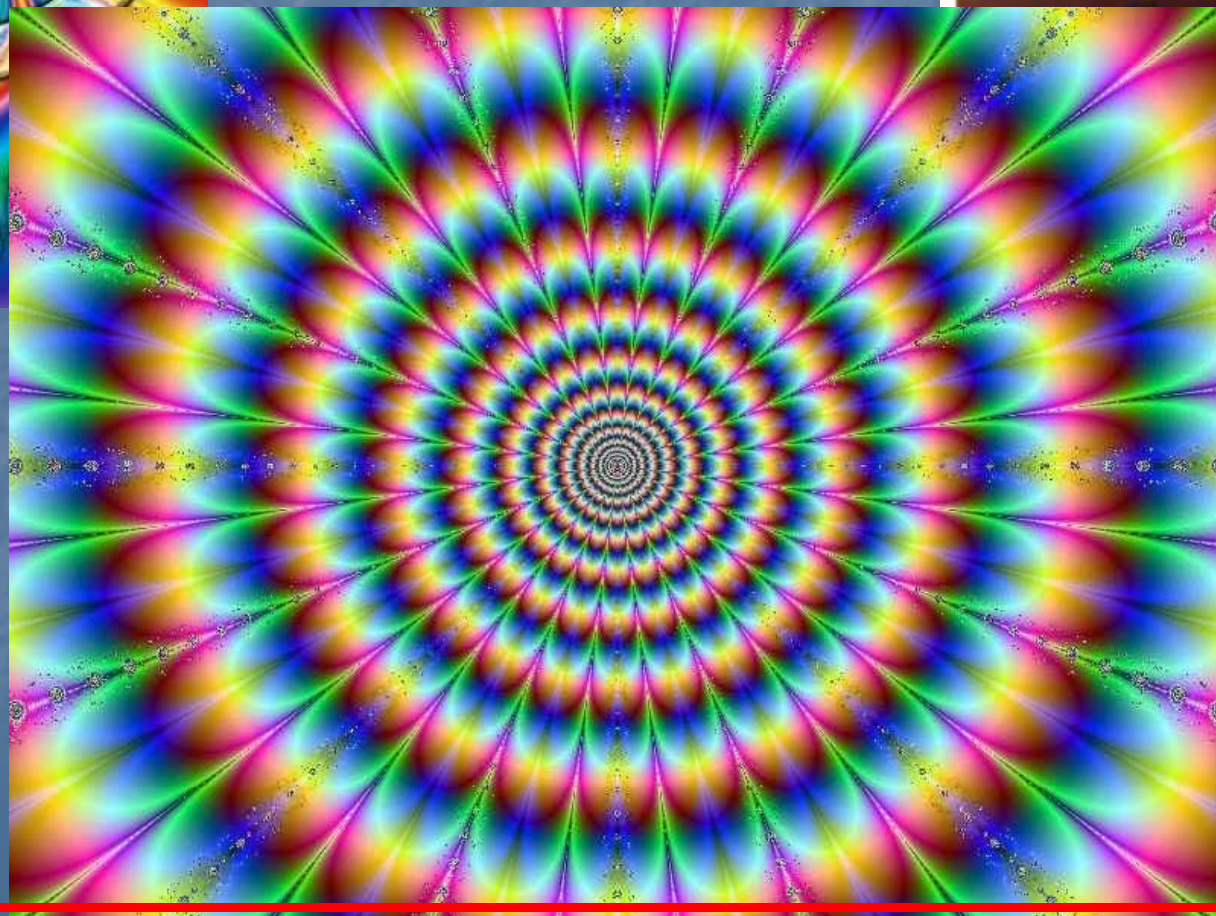
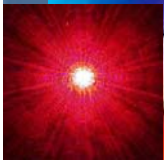
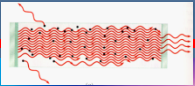
Raytheon Converter Gives 5 Million Analog-Digital Conversions Per Second
An advanced converter that can give up to five million conversions per second, digital-to-analog, or analog-to-digital, is being developed by Raytheon Company. This unit is more than 100 times faster than any other computer available. It is a 100-million-conversion-per-second, although the speed of the converter is limited to 10 million conversions per second at a low accuracy.

RAYTHEON

TESTIMONIAL DINNER: Dr. George W. Bailey, WSCA, center, executive secretary of the Institute of Radio Engineers, was honored at a testimonial dinner at the Shelburne Hotel, New York, Friday night by the Single Subband Amateur Radio Association and the Quarter Century Wireless Association. S. Edula Fisher, left, president of SSRAR, presents Dr. Bailey with a plaque in recognition of his attainments, while John D. Stasi, president and founder of QCWA, looks on.



Maiman y D'Haenens
con su primer láser,
25 años después





The Perris Progress

CENTS

YOUR HOMETOWN NEWSPAPER
SERVING THE BEAUTIFUL VALLEY SINCE 1901

9 — NUMBER 1

PERRIS, RIVERSIDE COUNTY, CALIFORNIA 92376

and com- to the District.



Troublesome Christmas trip for 3 students

We hope your Christmas trip was a happy one says Fernando Martinez, Luis Lopez and Jose Marin-Pereda, because their trip has been a trying and eventful trip.

All three of these young men are from Madrid, Spain, but are in this country studying at Colorado State University on a Fulbright Scholarship. Fernando and Luis are working on their masters degree and Jose is studying for his Phd.

They decided to take a small trip over Christmas Vacation, taking in the southwestern U. S.

Trouble didn't raise its ugly head until just outside of San Francisco where the clutch on the car started acting up. Then they blew two tires and had to replace them at a cost of about \$45.

Tires fixed and off to Los Angeles, but when they arrived the clutch went completely out, and it had to be repaired. Another \$150.

While their car was being repaired they had no place to stay, as they had been staying in the car. Fernando called a friend whom he had met in the Netherlands. He not only invited them to spend the night, but also to spend Christmas with him.

With the clutch fixed, and feeling merrier they



"HAPPY WANDERERS" — left to right: Fernando Martinez, Luis Lopez, and Jose Martin-Pereda!

headed for Tijuana. Sun City was their next and final 'Waterloo' as the engine broke down to the tune of approximately \$200. This was the end of the line as they had only paid \$350, for the car to start with.

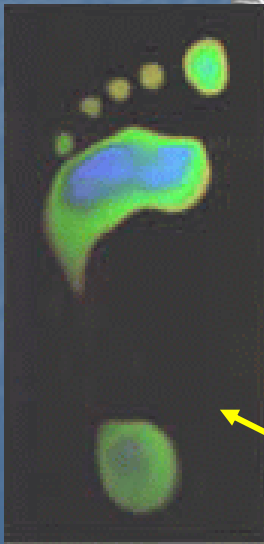
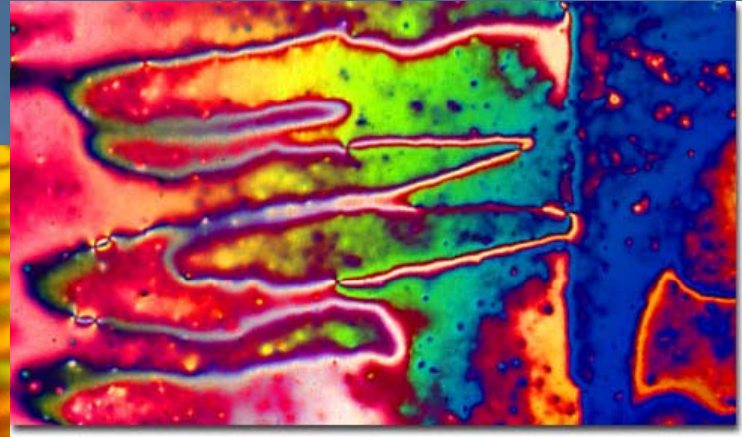
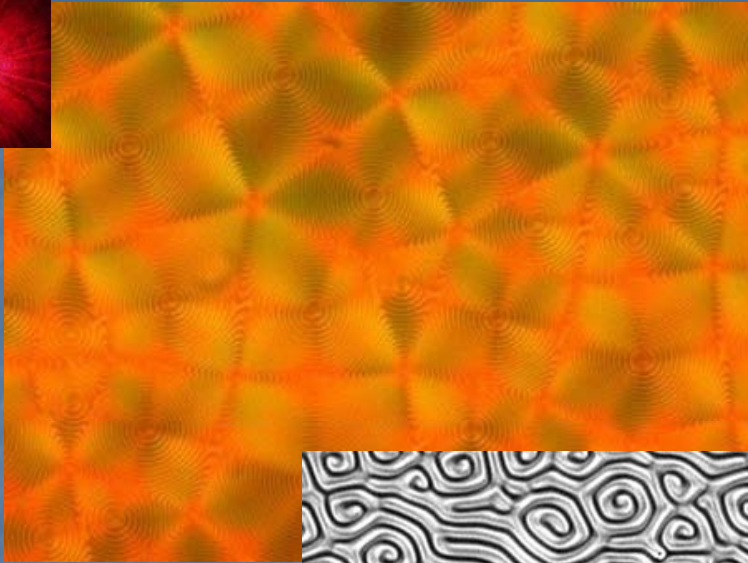
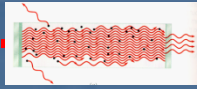
They sold the car for \$15 and hired a taxi to take them to the Greyhound Bus Depot in Perris.

After laying out everything they had in the car, including tent, etc., in front of Dorothy's they bundled everything so that

it would fit on the bus.

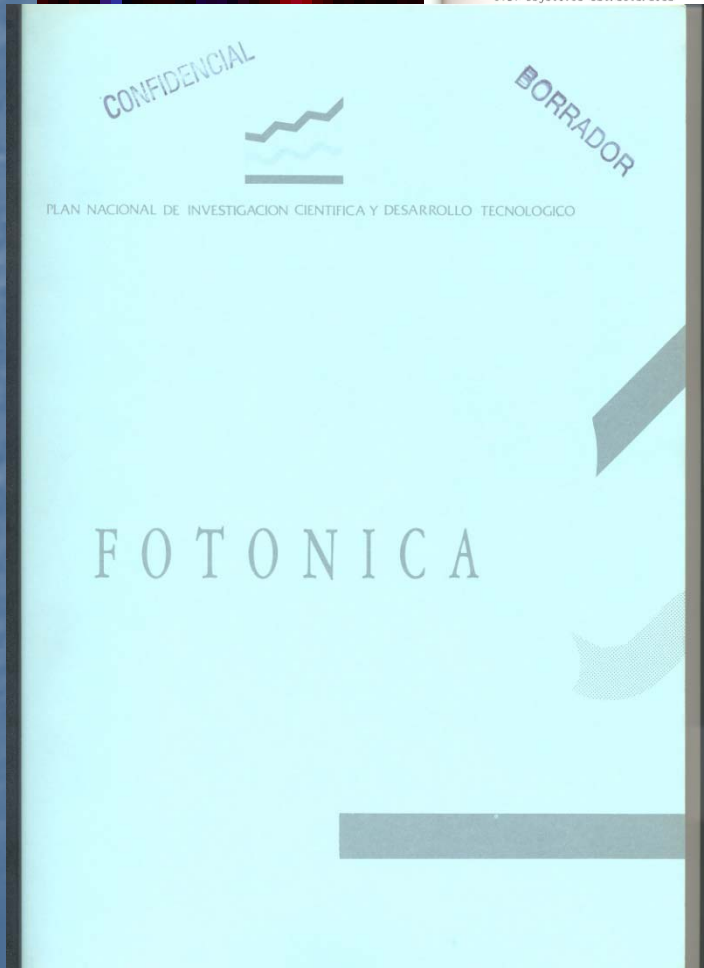
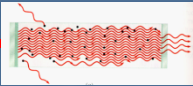
As they climbed aboard the bus to Ft. Collins, Colo. they vowed that all of this still wasn't going to spoil their trip, as they were going to stop at the Grand Canyon and anything else that struck their fancy.

Dwi
For
Smith
withou
we ar
ition o
"nasty
en the
fundar
of stud
is the
the gl
catafo
the d
they a
thing
situati
mirisc
siores
paid in
to trac
pany i
ive in
course
ket pla
trols o
service
Ever
wish f
type so
tually
outlaw
there n
to be s
custom
stamps
his bil
piddlin
the sti
the p
would
pany f
custom
receive
tired of
" Once
sought
in the



Medición de temperatura
con C.L. colestérico

Diferentes tipos de
texturas en algunos
cristales líquidos



CONTENIDO

1. Presentación

2. Justificación y análisis de la situación

2.1. Justificación

2.2. Análisis de la situación española actual

3. Objetivos

3.1. Objetivos científicos

3.2. Objetivos estructurales

superiores
cénico

abajo
Centros piloto

peos

Importancia en el Programa
ás importantes
fotópticas

Industrial
Comunicaciones
Informática
Defensa
Metrología y Meteorología
Medicina

piloto

dióxido de carbono
ito y orientación
de componentes ópticos pasivos
de baja luminosidad
os

integrada

COMISION DE PROGRAMA:

Presidente:
Ilmo. Sr. D. Javier Nadal Ariño
Director General de Telecomunicaciones
Ministerio de Trasporte, Turismo y Comunicaciones

Secretario:
D. José Antonio Martín Pereda
Secretaría General del Plan Nacional de Investigación Científica y Técnica.

Vocales:
MINISTERIO DE EDUCACION Y CIENCIA
D. Salvador Montero Martín
Subdirector Gral. Promoción de la Investigación
Dirección General de Investigación Científica y Técnica

MINISTERIO DE INDUSTRIA Y ENERGIA
D. Manuel Lázaro Lafuente
Jefe del Sº de Electrónica Profesional y de Consumo
Dirección General de Electrónica e Información.

MINISTERIO DE DEFENSA
D. Jaime Olivé Lafuente
Capitán de Fragata
Subdirector General de Tecnología e Investigación

MINISTERIO DE SANIDAD Y CONSUMO
Ilmo. Sr. D. Joaquín Márquez Montes
Subdirector General de Evaluación Sanitaria y Tecnología

CENTRO PARA EL DESARROLLO TECNOLOGICO E INDUSTRIAL
D. José Luis Guerrero López

CONSEJO DE UNIVERSIDADES
Pendiente de designar representante

FOTONICA
TECNOLOGIAS DE LA PRODUCCION Y DE LAS COMUNICACIONES

COSTE ESTIMADO DEL PROGRAMA
(millones de pesetas)

CONCEPTOS	* 1987	1988	1989	1990	1991	TOTAL cuatr.
Formación de Personal		0,0	181,2	375,0	445,0	1.001,2
Investigadores y Contratados		0,0	0,0	0,0	0,0	0,0
Infraestructura		0,0	160,0	315,0	700,0	1.175,0
Proyectos		0,0	300,0	600,0	700,0	1.600,0
Planes Industria y Concertados		0,0	98,7	495,0	935,0	1.528,7
Otros gastos		0,0	10,0	15,0	20,0	45,0
Aportación Fondo Nacional		0,0	750,0	1.800,0	2.800,0	5.350,0
Financiación Previa	845,9	1.147,9	845,9	845,9	845,9	3.685,9
Totales	845,9	1.147,9	1.595,9	2.645,9	3.645,9	9.035,9

* Se adjunta ficha presupuestaria de la financiación 1.987 por capítulos, con indicación de los organismos que contribuyen a dicha financiación.

**Programa nonato
Nacional de
FOTONICA
1987**



Fotónica

Algunas consideraciones sobre su desarrollo

En el presente artículo se trata un panorama fotónico en nuestras pautas de su desarrollo pasado su fuerte conexión con posibles de por dónde e mercados más significativas consecuencias.

Jose Antonio Martin Pereda

Photonics
Some considerations on its development

A general overview of the technologies is given in this paper. Some about their past, present and future a strong link between Photonics and Elect one of the most interesting points of the. Moreover, based on the market of some certain consequences can be obtained.

Introducción

Hace ahora algo menos d Calvinio inició la redacción de una iban a servir de base para un conju que iba a desarrollar en la cátedra Norton Poetry Lectures», en la U. vard. Estas notas quedaron incoñch su autor pero, lo que se conserva [l de lo que él pensaba podían ser los deberían conservarse en el próximo mente, estos valores se referían a comunicación poética pero por su que tienen de común con el tema qu creído podían servir de punto de Los valores a que se refiere Calvin rapidez, la exactitud, la visibilidad. Cualquiera que haya, aunque hojeado lo que suele haber detrás que se realice sobre la Fotónica es s

MUNDO ELECTRONICO/Noviembre 1989/

Microelectrónica

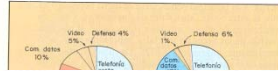
Microelectrónica

Proceso materiales
Medicina terapéutica
Diagnóstico médico
I + D
Impresoras
Separación de color
Comunicaciones
Memorias ópticas
Lace código barras
Almacenamiento y control
Medidas
Entertainment

Microelectrónica

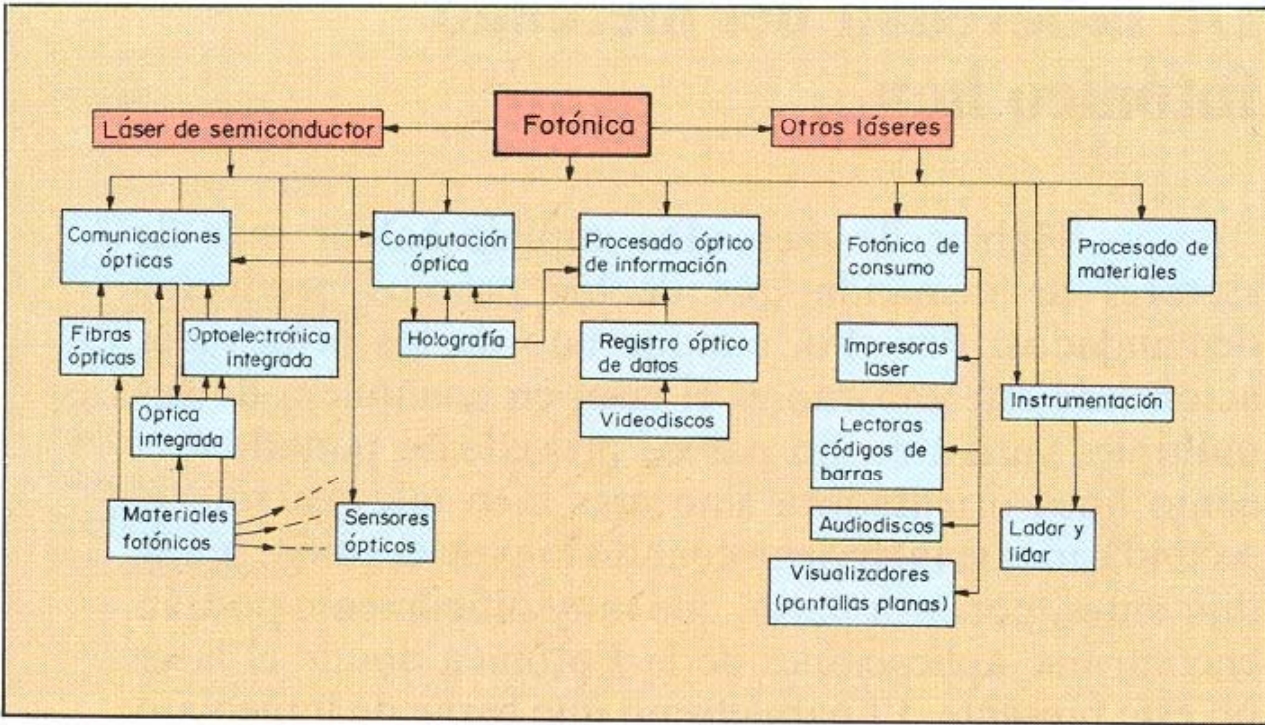
situación que se presenta es la que puede verse en la figura 2. En ella se da el reparto entre los varios sectores, para 1988 y para 1990. Como puede apreciarse, el mercado de la telefonía muestra una notoria tendencia a la baja mientras que el de comunicaciones de datos ofrece la tendencia opuesta. En cualquier caso, las perspectivas que aparecen son bastante optimistas. Una muestra de ello es el gran número de compañías que se han consolidado y el de las que han aparecido. Los quesos de la figura 2 parece pueden dar de comer aún a

1988	
Larga distancia	126.978
Intermedias	71.906
Corta distancia	202.756
Bucle de abonado	60.885
Submarino	25.312
Com. Datos	138.891
Defensa	105.010
Video	18.616



Microelectrónica

empuje. Y para ello habría que volver a la figura 1 en la que se esbozaron algunas de las áreas más significativas por las que la Fotónica se mueve. Como también se ha dicho, no todas ellas se encuentran en el mismo nivel de desarrollo. Muchas ya tienen casi veinte años de vida, mientras que otras aún no han pasado de la fase de y en estas vor a menor in un cierto ficado volver o que hace ro si parece un área muy via es objeto si otro que el

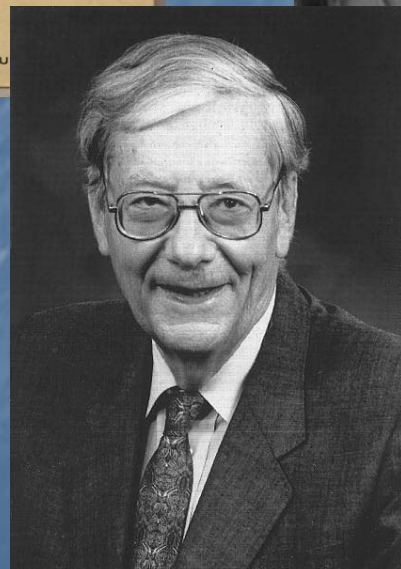
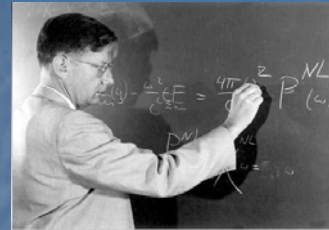
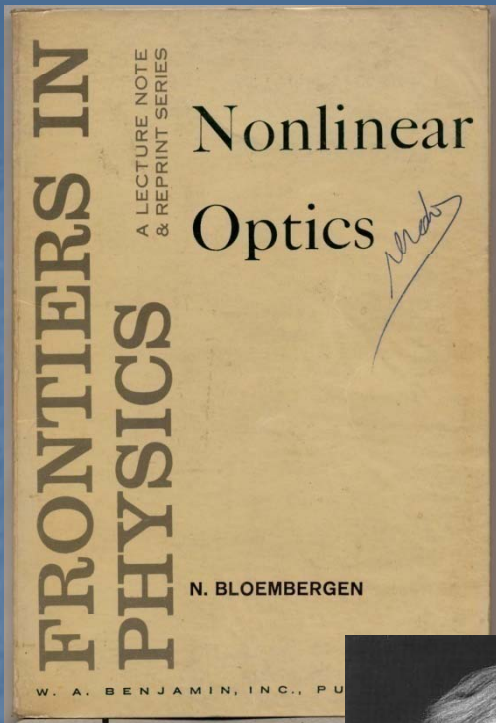
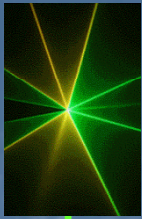
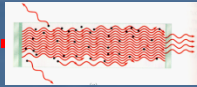


as preguntas que cuando los ópticos. A uesta que se or completo gitudades. Y s el de que el todavía un res existian. s problemas, electrónicos o tiempo. O es máquinas y mucho más contrario, se las operacio- in llevarse a titer caso se ntras que en de tareas. El se trata de l segundo de rimero sería ritras que el os. tante difusa, ndo en ella n. Otrazs es aracterística s materiales os a que se rdo en casi ónicos para ordenadores r filosofías clásicas de a conclusi- o que ya se os sistemas rónicos son a que éstos.

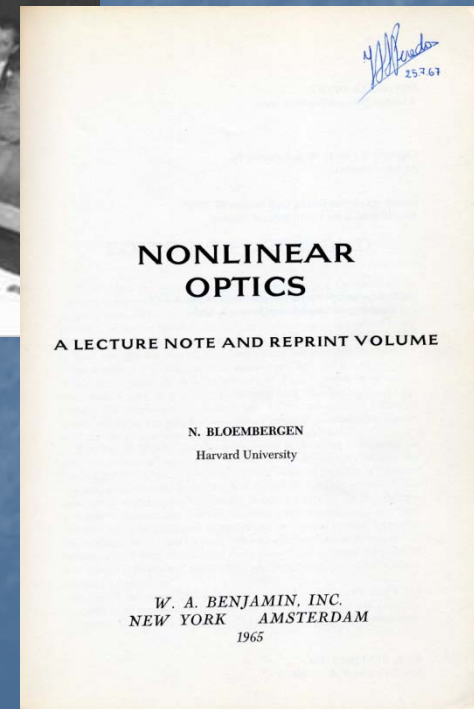
171

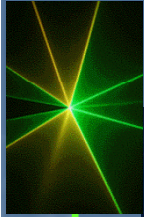
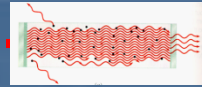
Figura 1. Actividades de la Fotónica.

MUNDO ELECTRONICO/Noviembre 1989/200



November 1, 1958





LASER PIONEERS

Revised Edition



Jeff Hecht

NICOLAAS BLOEMBERGEN

Masers and Nonlinear Optics

Born in Dordrecht, the Netherlands, in 1920, Nicolaas Bloembergen came to Harvard University after World War II to complete his doctoral thesis research on nuclear magnetic resonance. He joined the Harvard faculty in 1951 and was named Gordon McKay Professor of Applied Physics in 1957. He later became the Rumford Professor of Physics, and in 1980 he was named Gerhard Gade University Professor at Harvard. He became Professor Emeritus in 1990.

In the 1950s Bloembergen pioneered development of the three-level solid-state maser. After the laser was developed, his research interests turned to nonlinear optics. His theoretical work, which laid the groundwork for the field, was first published in the early 1960s and summarized in his 1965 book, *Nonlinear Optics*. That work on nonlinear interactions also led to development of techniques for extremely high resolution laser spectroscopy. He received the 1981

developments by participating in conferences and by finding time to catch up with the research literature.

Q: If you had it to do all over again, would you still work in this field?

Bloembergen: Yes, it has been a good field, a very fruitful field. But my answer would be different if I were to start out as a young graduate student now. I wouldn't go into it because the field has matured. I probably would go into biophysics and biochemistry, because there you can still do some relatively small-scale experiments. If you are clever in your experimental techniques and understand the field, you can do some really clever things quickly in a small group.

*Sols sé que miro el riu
al llarg de la ribera;
i sempre sóc el punt
on l'aigua fa el seu pur
començament de perdre's.*

CARLES RIBA