the thymine component of DNA, while the gold chloride ion stained all nucleotides except the thymine and uracil. The third phase of the work includes the collection and analysis of the data. The main problem of this aspect concerns the visibility of the small markers made necessary by the close spacing of the bases. In this connection it was possible to show that a single polynucleotide chain in which one heavy gold atom is attached to every nucleotide is detectable by high resolution techniques. From such data, the level of visibility of single heavy atoms can be directly inferred and these most recent micrographs represent our most reliable statement to date on that quesion.

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Laser Flash Lamps

The use of flash lamps as pumping sources for high-power lasers was discussed at a conference held at Stanford Research Institute, Menlo Park, California, 20 February 1964. The purpose of the conference was to define the present boundaries, both experimental and theoretical, in this specialized field of gaseous discharges, and to delineate promising avenues for future research and development toward the general goal of effective pumping of large laser systems.

As representative of the best available high-power lamps, Stig Claesson (Uppsala University) described his flash photolysis program, oriented primarily toward production of extremely short pulse, high-intensity ultraviolet radiation. Claesson reported on his 6-meter quartz tube filled with oxygen, through which 120,000 joules can be discharged in 180 microseconds (670 megawatts). Actinometric determinations indicate a conversion efficiency of 15 percent from electrical input into photons of wavelengths between 2000 and 4500 angstroms. This conversion efficiency appears to remain constant for any lamp configuration, including his 2.5-cm lamp, through which he has been able to discharge 200 joules in 2 μsec (100 Mw). An important innovation, as compared with more usual flash lamps, at least, is the use of a 2-mm hole, drilled through the base, connecting to a large ballast volume also filled with oxygen at 20 to 30 torr. The purpose, here, is to allow the quartz which distills off the walls of the tube to collect outside the flash lamp, thus continually polishing and cleaning the walls and allowing these lamps to be used for a year or more. Also, data were presented on the well-known phenomenon of brightness saturation in which, for a given photon wavelength, increasing discharge energy finally fails to produce more photons.

Charles Church described Westinghouse's research in high-energy coaxial lamps, with particular reference to absolute spectral irradiance for xenon lamps at various pressures and current densities. Further comment on the "saturation" effect was made. Time-resolved spectra on xenon lamps doped with metallic halides indicated weak enhancement of the major emission of thallium iodide, for example, coupled with an unusually high emission in the normally weak bands, according to Church. He described briefly the use of a coaxial lamp for pumping a neodymium-doped, Eastman Kodak laser glass rod, 30 cm long and 1.3 cm in diameter. Efficiency of 0.5 percent up to an output of 95 joules was reported.

John Emmett (Stanford University) summarized direct measurements of the opacity of a PEK XE-17-6½ xenon lamp. The gas pressure is 300 torr and the tube diameter is 12 mm. Data obtained by Emmett, Schawlow, and Weinberg on the transmission as a function of wavelength from 2500 to 10,000 Å and at current densities up to 5000 amp/cm^2, show that absorption increases with current and with wavelength. Above 5000 Å and a current of 4000 amp/cm^2, a discharge tube 1 cm thick is nearly opaque. For shorter wavelengths or lower currents, the discharge is fairly transparent.

Efforts to utilize nonthermal excitation of the optical radiators through the use of a theta pinch discharge were described by J. M. Feldman (Carnegie Institute of Technology). By this method, current densities of 10^6 amp/cm^2 are obtained in a 400-joule, 1-μsec discharge, radiating from a 9 cm^2 surface area. Electron temperatures of 360,000°K are inferred from comparison of several lines of known statistical weights, assuming a Maxwellian energy distribution. Direct measurements of resistivity, using a relationship developed by Spitzer, appear to confirm this theoretical value. Following this paper, a lively discussion ensued, directed primarily toward the interpretation of the data leading to estimates of electron temperature. Spectroscopic data on lines such as argon I and II, which were fairly dense, would, it was remarked, make it impossible for such high electron temperatures to have existed. This controversy was allowed to develop further during the afternoon, since the advantages of an electrodeless, cool-wall, high-spectral radiation lamp are manifest.

Reviewing recent work at the Naval Research Laboratory, Alan C. Kolb discussed double-pulsed techniques similar to those of Emmett and Schawlow, and pointed out that at wavelengths below 3000 Å the ultraviolet enhancement remains for a long time after the short second pulse has terminated. He observed that, with xenon at a pressure of 100 to 400 torr, the total power emitted, due to silica distilled from the walls in the 2000- to 3000-Å region during the short pulse, is comparable to the entire output above 3000 Å. Kolb further described T-type shock tubes which, operating in helium at 10 to 50 torr, produce 100 kw/cm^2 for every 100 Å of bandwidth in the near ultraviolet. Nearly all of this portion of the spectrum was described as being silica line spectra. A new mechanism for lamp damage was also described. The intense line radiation below 1900 Å is absorbed within 0.1 mm of air external to the tube, thus producing a hot layer and a pressure pulse, which results in destruction of the tube wall by external shock. Theta pinch calculations coded for use with an IBM 7090 were also reported as a part of the NRL activities.

H. Koenig (General Electric) reported on attempts to use xenon lamps doped with gallium and thallium iodide. As might now be anticipated from the opacity measurements reported above, little enhancement can be observed for reasonably large bore tubes.

Attendance at the conference was limited to approximately 40, including scientists from the research departments of companies presently engaged in manufacturing flash lamps or holding government contracts in this area, as well as university and government researchers. Six invited papers occupied the morning session, while the afternoon was devoted to an informal discussion among all participants. Arthur Schawlow served as moderator of the afternoon session. He called first for comments on the morning's papers, then for more speculative suggestions and remarks which might shape future research programs.

Proceedings of this conference, which was sponsored by the Office of Naval Research, will be published and made available to interested firms and individuals.

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Forthcoming Events

April

26–27. **Water and Geology**, conf., Bloomington, Ind. (A. F. Agnew, Dept. of Geology, Indiana Univ., Bloomington)

26–30. **Cereal Chemists**, 49th annual, Toronto, Ont., Canada. (N. G. Irvine, Grain Research Laboratory, 190 Grain Exchange Bldg., Winnipeg 2, Canada)

26–30. **AAAS, Southwestern and Rocky Mountain Div.**, Lubbock, Tex. (M. G. Anderson, P.O. Box 97, University Park, New Mexico 88070)

26–30. American **Industrial Hygiene** Assoc., Philadelphia, Pa. (G. D. Clayton, 14125 Prevost, Detroit 27, Mich.)

27. **Tooth Transplant** in Humans, intern. seminar, New York, N.Y. (S. J. Behrman, New York Inst. of Clinical Oral Pathology, 101 E. 79 St., New York 21)

27–28. **Molecules of Life**, colloquium, Yeshiva Univ., New York, N.Y. (B. Horecker, Dept. of Molecular Biology, Yeshiva Univ., 1300 Morris Park Ave., New York 61)

27–29. American Assoc. for **Thoracic Surgery**, Montreal, Quebec, Canada. (AATS, 311 Carondelet West, 7730 Carondelet Ave., St. Louis, Mo. 63105)

27–29. **National Acad. of Sciences**, annual, Washington, D.C. (Office of the Home Secretary, NAS, 2101 Constitution Ave., NW, Washington, D.C.)

27–29. National **Watershed** Congr., 11th, Little Rock, Ark. (G. K. Zimmerman, 1424 K St., NW, Washington, D.C.)

27–30. American **Physical** Soc., Washington, D.C. (K. K. Darrow, APS, Columbia Univ., New York 27)

27–1. **Photographic Science and Engineering**, intern. conf., New York, N.Y. (W. Clark, Eastman Kodak Laboratories, Rochester, N.Y. 14650)

28–30. **Micrographic** Congr., intern. conv., Philadelphia, Pa. (C. E. Nelson, 313 N. First St., Ann Arbor, Mich.)

28–1. Dallas-Southwest **Industrial Trade** Fair, Dallas, Tex. (C. L. Wells, P.O. Box 26010, Dallas 26)

29–1. **Acoustical Fatigue**, 2nd intern. conf., Dayton, Ohio. (D. M. Forney, Research and Technology Div., U.S. Air Force Systems Command, Wright-Patterson Air Force Base, Dayton)

29–2. **Peaceful Uses of Space**, 4th natl. conf., Boston, Mass. (G. A. Rogovin, 501 Boylston St., Boston 16)

29–2. American **Thyroid** Assoc., annual, Rochester, Minn. (T. Winship, ATA, 110