

on tube development by the group around Vladimir K. Zworykin, perhaps the most glamorous figure in the center's history.

Now the center's sights are set on high-definition television, which is quite important in its business planning, Tietjen says, and which also could be quite important to the performance of US electronics companies in the 1990s.

Work on the Sarnoff Center's HDTV system, which it calls Advanced Compatible Television (meaning it is compatible with current television sets), is centered primarily in Carnes's shop, but Brandiger's division also does important R&D on things like materials development for screens. The research accounts for 35-40% of staff time in Carnes's division and a not insubstantial fraction in Brandiger's.

On 19 April, the 50th anniversary of the first public broadcast of television at the New York World's Fair in 1939, the lab successfully transmitted what it refers to as "first phase" ACTV images from the top of the World Trade Center in Manhattan to receivers at Sarnoff in Princeton. Carnes said on the occasion: "This is the first time that anyone has successfully broadcast advanced television signals by regular terrestrial means. This clearly puts us in a leadership position." Zenith, which is working on advanced television R&D in conjunction with AT&T, issued a statement warning that it would be a serious mistake for the Federal Communications Commission to adopt a standard based solely on evaluation of a first-phase system. (Zenith often is referred to as the only surviving American television manufacturer, but what this means is that it is the only American-owned manufacturer; Thomson and Phillips both are larger manufacturers of televisions in the United States.)

James H. Clingham, Sarnoff's vice president for legal and public affairs, says that half the work under the \$250 million GE contract still is directed by GE divisions but that the part pertaining to television is directed by Thomson through its consumer electronics group in Indianapolis, Indiana. The GE-RCA television people who were transferred to Thomson are still running the show, to be sure, but the center also is beginning to cooperate with several labs in Europe that Thomson has working on HDTV. Carnes says the center is continuing to work rather independently on a transmission system suitable for use in the United States, but that there is increasing cooperation with the

Thomson staff on other aspects of HDTV design.

Because of big questions concerning consumer preferences in the 1990s and alternative methods of image transmission such as fiberoptic cable,

INSTITUTE FOR ADVANCED STUDY: PAST AND FUTURE

Marvin L. Goldberger took over as head of the Institute for Advanced Study in September 1987, returning after nine years as president of Caltech to the town where he lived and worked as a physicist from 1957 to 1978. On 26 April, Goldberger stopped in at PHYSICS TODAY's office in Manhattan to discuss the state of the institute.

—WILLIAM SWEET

PT: Ed Regis goes on in his book *Who Got Einstein's Office?* [Addison-Wesley, 1987] about how isolated the institute is from Princeton and the university. What is the feeling about those relationships now?

Goldberger: It has gone through phases. When Robert Oppenheimer came, it was a place that was a little mysterious, inhabited by people who talked with funny accents. They were not people who had been undergraduates at Princeton and they were not rich. Einstein, of course, shed a tremendous aura over the institution and over the town, but there was really very little interchange between the people of the institute and the people of the town. For whatever reason, Oppenheimer was not clasped to the bosom of the town. He tended to be, I think, a little arrogant and the Princetonians didn't appreciate that. As for relations between the institute and university, from an intellectual standpoint, I think that those probably have always been very close. The institute was originally housed in Fine Hall, the mathematics building of Princeton University, until the opening of the present campus, which didn't come until 1939.

I suspect there are still people in Princeton who don't really know very much about the institute: They don't know exactly where it is and do not clearly understand that it is a free-standing institution that has no formal connection with the university. We are entirely separate financially and administratively, though there is very strong interaction at an intellectual level. There are joint seminars in all the areas we are involved with, and we are in and out of each other's pockets, not financially, but intellec-

tually. HDTV is a big gamble, and everybody knows it. But to the extent it continues to be a focal point of global competition in the next ten years, Sarnoff seems certain to stay in the center of things. —WILLIAM SWEET

tually.

I've been particularly anxious to work toward strengthening the relationships between the institutions with an eye to seeing how we could help each other—how we could complement each other to make the whole greater than the sum of the parts. There are a few formal things that we are trying to initiate, but by and large, strengthening the informal relations is the most effective. People of the institute faculty teach on a voluntary basis. They take graduate students and supervise theses. So there is already a lot of progress.

PT: The institute still doesn't grant degrees?

Goldberger: We don't grant degrees, although technically we are a degree-granting institution. It was Abraham Flexner's original idea to have graduate students, but he was talked out of that by Veblen, who said instead it should be a postgraduate institution. [Flexner was the institute's first director, and Oswald Veblen was the first head of the institute's school of mathematics.]

PT: What about your relations with other institutions?

Goldberger: For example, there has been at the institute for the past 17 or 18 years a weekly astronomy lunch, which is attended by people up and down the Eastern Seaboard interested in astrophysics. Tony Tyson comes down from Bell Labs. People occasionally come from the Exxon research labs. They come from Rutgers, Columbia, the universities of Maryland and Pennsylvania, and of course Princeton University. They come for lunch [specifically] because we have the best dining room in a radius of 100 miles, or at least 50 miles. There is an analogous social science lunch, usually with 50 or more people from the institute, including some physicists, and from Princeton, Rutgers and so on.

People from all four schools of the institute—mathematics, physics, social sciences and historical studies—very frequently attend seminars and participate in programs with colleagues from all neighboring univer-