The diagnostic radiologist occupies a unique position as consultant to all physicians in the management of patients with cancer.

That's true. He helps not only establish the diagnosis of cancer but also aids in accurately locating and staging the disease. For instance, techniques like specimen radiography, fluoroscopy and lymphangiography identify sites for biopsy. Diagnostic radiology also provides data for judging response to therapy, establishing baseline studies and following the patient's progress.

Haven't adjunctive measures also aided the radiologist in his search for early cancer?

Yes, great advances occurred as new instruments and improved techniques were discovered. The earlier detection of lung cancer is largely due to the fiberoptic bronchoscope and bronchography. Similarly, prompt diagnosis and even removal of asymptomatic lesions of the right colon—beyond the reach of the proctosigmoidoscope—is now achieved with the new flexible colonoscope. Better detection of early breast cancer is also due to refinements in mammographic techniques and greater training of technologists and radiologists.

How does xeroradiography compare with mammography?

Xeroradiography is a new imaging process which uses a photoconductive, selenium plate instead of the conventional X-ray film and cassette. Xeroradiography may be easier to interpret and can reveal finer detail than standard mammograms, but clinical use has been
hampered by frequent equipment difficulties. Hopefully, as improvements are made, more physicians will be trained in all types of radiographic procedures.

**Editor:** *Is radiation exposure a major problem with mammography?*

**Dr. Stein:** A small amount of radiation is absorbed by the breast, but the benefits far outweigh any potential risks. New methods have been devised which greatly reduce radiation dosage per exposure and enhance the contrast of the soft tissues of the breast.

**Editor:** *Has thermography proved a valuable tool for detecting breast cancer?*

**Dr. Stein:** Thermography which visually displays heat emission from the surface of the breast is useful when combined with mammography, physical examination and a careful history. About 90 to 95 percent of breast cancers will register at least one degree C. more heat emission than an unaffected breast. Increased vascularity is also noted. However, thermography can miss a large breast cancer or yield a high percentage of false positives. Nevertheless, since it does not involve radiation and can be quickly performed and interpreted, it may become a good screening procedure for high risk patients.

**Editor:** *How is tomography best applied?*

**Dr. Stein:** Tomography sharply focuses a structure by blurring out the shadows of surrounding areas. Also, by simultaneously moving both the X-ray source and the roentgenographic film, "slices" of a particular site can be studied at different depths. With recent improvements in equipment, tomography is now being used to better define lung, skull and spine tumors. It is especially effective in demarcating extension of a soft tissue tumor into bone or brain and in accurately evaluating the hilum of the lung in patients with malignant lymphoma.

**Editor:** *Can ultrasound provide additional anatomical information?*

**Dr. Stein:** Yes. Ultrasound shows structures in excellent two-dimensional form. It is very helpful in determining the consistency of abdominal masses and differentiating cystic from solid lesions. Biopsy of solid lesions or needle aspiration of cysts can be accurately done based on the anatomical information obtained.
Editor: *What is the current status of radioisotopes for scanning?*

Dr. Stein: Radioisotopic bone scans are very valuable in diagnosing primary or metastatic cancer several months earlier than roentgenograms. For example, approximately 50 percent vertebral destruction must be present before an X-ray reveals sufficient evidence for diagnosis. Charkes reported that bone scans are diagnostic in about 14 to 34 percent of patients with bone metastases whose roentgenograms were considered normal.

Editor: *If a bone scan is positive and the X-ray is negative, how do you confirm the diagnosis?*

Dr. Stein: Based on localization of pathology by bone scanning, percutaneous needle biopsy can be performed under fluoroscopic guidance.

Editor: *What are some of the newer radioisotopes?*

Dr. Stein: Radioactive nuclide $^{99}$Tin-Polyphosphate (Tc-PP) has been recently developed and provides high quality bone scanning with a low dose of radiation. $^{67}$Gallium citrate is also a new agent with a short half life that shows selective uptake in patients with melanoma, lung cancer, Hodgkin’s disease and malignant lymphoma. Whole body rectilinear scans can also document abscesses and tumor infiltrates and are useful for evaluating bone pain in patients with acute leukemia. However, it is not possible to differentiate infections from cancer since gallium uptake is increased in both. Currently, the mechanisms for the uptake are not precisely known. Another new isotope is bleomycin tagged with ‘‘indium’’ which is useful in the detection of a wide variety of cancers. It has the disadvantage, unfortunately, of also being picked up by infections.

Editor: *Does the EMI scanner hold promise for the future?*

Dr. Stein: The EMI scanner has undergone extensive clinical evaluation and is rapidly gaining popularity, especially for the diagnosis of brain diseases. The system combines the transmission of X-ray photons with tomographic techniques and computerizes the information to give an accurate indication of the nature and location of a lesion, in three dimensions. There are only a few EMI scanners in the United States at the present time, since they are expensive and have a high annual maintenance cost. But a number of institutions are interested in obtaining them and the EMI scanner may eventually re-
place angiography, radioactive isotope scanning and pneumography for brain diseases.

**Editor:** Do you use lymphangiography as the primary method of evaluating lymph node involvement in patients with Hodgkin’s disease?

**Dr. Stein:** Lymphangiography is a very accurate way to help stage patients with Hodgkin’s disease. It is also useful in therapy by ensuring correct placement of treatment portals. Since the lymph nodes retain the lymphangiography dye for a long time, response to irradiation or the presence of recurrent disease can be noted on follow-up X-rays.

**Editor:** Are lymphangiograms used only in the work-up of patients with Hodgkin’s disease?

**Dr. Stein:** No, they are also becoming increasingly important in the evaluation of patients with ovarian, cervical, uterine, testicular and prostatic cancer where precise knowledge of lymph node involvement is necessary in treatment planning.

**Editor:** What about venography?

**Dr. Stein:** Orbital venography helps evaluate patients with unilateral exophthalmos and plan surgical treatment. Plain films must precede orbital venography and tomography may be necessary to detect bone abnormalities.

**Editor:** Have advances occurred in the use of arteriography?

**Dr. Stein:** There have been constant refinements of techniques for the placement of catheters and the infusion of contrast agents for diagnosis or for the infusion of radioprotective substances and chemotherapeutic drugs.

**Editor:** Thank you, Dr. Stein.