the hearings, and no special notice was taken of the fact that enactment of the resolution would send the Agriculture Department off on a decidedly new research tack.

The proposal, in the form of a House Joint Resolution (H. J. Res. 915), says, in part, "that the Secretary of Agriculture is authorized and directed to establish and place into operation at the earliest practicable date a special program of research into the production, handling, manufacture, and use of tobacco products and eliminate therefrom factors, properties or substances which may be detrimental to health. Such special research program shall include authority to establish and operate laboratories and field stations, including the acquisition of land or interest therein, as determined by the Secretary to be necessary. . . ."

The Department of Agriculture (USDA) now spends an estimated grand total of $2.3 million a year on all types of tobacco research, but this includes sums spent for marketing and economic research and for a wide range of industry-related projects, including the development of a mechanical tobacco picker. A sum of about $1.5 million a year is usually quoted as the estimate of federal funds which go mainly into crop research to improve the yield and quality of tobacco and develop types for which there is strong market demand.

As Nyle C. Brady, director of science and education for the USDA, told the subcommittee at the hearings, "the Department's research programs on tobacco have emphasized the quality factors and have not been directly involved with the effects of smoking on human health."

Brady followed the same cautious line taken by Terry when he said, "remedial action poses a problem of great difficulty since it is by no means certain at the present time what components of the tobacco leaf and smoke are the responsible agents, although many chemical agents have been implicated. Nevertheless, it is important that extensive investigations be undertaken to solve this problem both by chemical studies aimed at eliminating suspected carcinogens from the smoke and through genetic, cultural, physiological and chemical studies designed to eliminate harmful substances from the leaf."

Brady also noted what seems to be one of the most ominous clouds on the research-for-safety horizon when he mentioned that burning of non-tobacco vegetable material produces what has been identified as a carcinogen.

The USDA, Brady testified, plans a "redirected, intensive tobacco research program." Agriculture researchers would like to see a new laboratory established to follow the new line of tobacco research.

In his remarks, Brady observed: "The problem is a complex and difficult one. A concerted effort by a team of highly trained specialists—geneticists, agronomists, chemists, physiologists, pharmacologists, physicists, fermentologists—working together in a fully adequate facility, and in cooperation with federal and state research groups, represents the best way to mount an effective assault on the many phases of this problem and to provide leadership for a meaningful supplementary contract and grant program." Brady goes on to say that the "Agricultural Research Service and the State Agricultural Experiment Stations have developed considerable information in this field and have the necessary nucleus of capable research personnel and leadership upon which an effective expanded program can be built."

There seems to be general agreement that a new, closer relationship should be developed between agricultural researchers. And because the Agriculture Committee's authority is limited to the Department of Agriculture, it is natural that the committee placed responsibility for its crash program in tobacco research under the wing of the USDA.

The resolution gives the Secretary of Agriculture considerable leeway in operating the program. He can use the services and facilities of other agencies and enter into contracts and agreements with state agencies and private interests. Brady, for example, said that "carcinogenicity studies, when required, will be carried out in cooperation with the Department of Health, Education, and Welfare [departmental parent of the National Cancer Institute] or other qualified organizations."

But the research program clearly would be administered by the research arm of the Department of Agriculture, and the obvious question, which so far has not been carefully discussed, is whether the USDA, with its experience and competence in crop research is the agency best suited to oversee a program with heavy overtones of health research.—JOHN WALSH

Subways and Science: Two N.Y. Institutions Consider Meaning of Coexistence in Crowded Manhattan

They that stand high have many blasts to shake them.—SHAKESPEARE.

New York, N.Y. This is the story of an improbable collision between two monuments to New York City's science and technology, the Rockefeller Institute and the subway system. In 1901, John D. Rockefeller gave money to some scientists to found an institution to promote medical and scientific knowledge. Three years later New York City began operating its first underground subway car. Years went by, and both organizations grew to maturity, preoccupied with their own duties, happily uninvolved in one another's existence. The Rockefeller Institute came to occupy a snug, tree-lined campus running from 65th to 68th Streets along Manhattan's York Avenue, where scientists could pursue their researches in a peaceful, sumptuous atmosphere, a part of, yet protected from, the noise and confusion of New York. The Transit Authority, managers of the subway system, accquired 6000 subway cars, 237 miles of track, and 4.7 million people riding them every day.

One day, late in 1963, the Transit Authority decided to build a new tunnel to provide another link between Manhattan and Queens. To build it, the engineers reasoned, they would need three vertical shafts connecting the tunnel with the surface. One shaft would be for construction, two would be for ventilation and emergency exits. There were to be one each at the Manhattan and Queens ends of the tunnel and one in the middle, on a small piece of land called Welfare Island. The Manhattan shaft, according to the initial blueprints, would burrow up from underground through 100 feet of solid granite at a site on York Avenue at 64th Street, nestled just south of the Rockefeller Institute. The era of peaceful, if unwitting, coexistence came to a close.

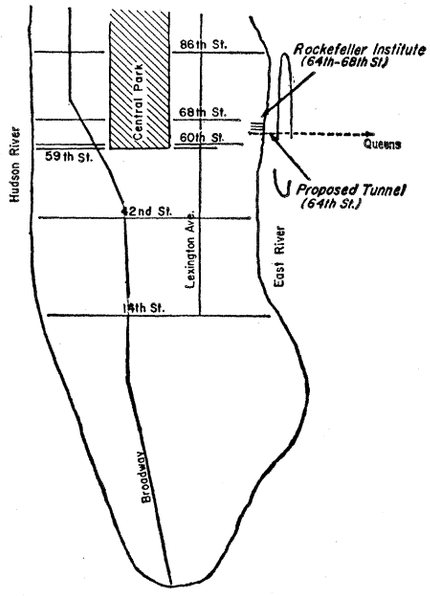
You would think that, as they walked around at 64th Street and contemplated their lengthy blasting project, at least one representative of the Transit Authority might have gazed up at the impressive line of buildings formed by the Rockefeller Institute and wondered just what went on there. He might, at least, have reported to his superiors that the imposing campus existed, and suggested that discreet inquiries might

be in order. But apparently no one did.

The first encounter between the two institutions came after the TA's plans had been approved by the city government and news of them had reached the Institute. A relatively low-level scout from the Institute was then sent out to reconnoiter the Brooklyn offices of the Transit Authority. He was met by a relatively low-level defender of the TA, and the two, apparently lacking the finesse of their respective employers, fell to talking in absolutes. The assertion, "You can't build your tunnel, it would ruin our institute," was countered with, "The tunnel is being built, and for that matter just what is your institute?" and the legacy of the meeting was a mutual sense of unreasonableness.

At that stage it appeared that the shaft at 64th Street was to be the principal construction shaft. Officials at the Rockefeller Institute were beset with nightmares. There would be blasting, day and night, for several years. Heavy trucks, loading and dumping the diggings, would roam the streets surrounding the Institute laboratories. Concrete mixers would spin without cease. And many delicate laboratory instruments would be rendered useless by the resulting vibrations—all for the purpose of constructing a subway-car passage which, in itself, posed possibilities for further vibrations.

The news that the Transit Authority had not been instantly swept with remorse about its horrendous, if accidental, affront to science apparently took officials of the Rockefeller Institute by surprise. Detlev Bronk, president of the Institute and former president of the National Academy of Sciences, then did what any high-level executive who had served an apprenticeship in Washington would do: armed with a document detailing the anguish of the scientists at the expected interference with their work, he invited the transit commissioners to a summit luncheon. Bronk explained the work of the Institute, told about the problems the vibrations were expected to cause, and even went to the unlikely extreme of suggesting that if the plans were not changed, the Institute would have to consider moving from its present site. Bronk's document, according to the New York *Times*, contained the following notations from institute scientists: From Edward H. Ahrens, Jr.: "My microbalances would be impossible to use; optical records would be put out of



Site of proposed tunnel.

order." From Lyman C. Craig: "No microanalysis of chemicals would be possible . . . [I] would have to go elsewhere to work." It was the commissioners' turn for surprise.

"I like to regard myself as fairly alert and well-informed," Transit Commissioner John J. Gilhooley said in an interview with *Science*. "But to be perfectly frank, when we started working on plans for this tunnel, I had only vaguely heard of the Rockefeller Institute and had no idea at all about the importance of its work. Why there are nine Nobel prizewinners at work right in those few blocks. The last thing we want to do is interfere with their experiments or drive them out of New York."

The luncheon, begun with a touch of hostility, ended in gentility. They were not going to put the construction shaft at 64th Street, the commissioners said, only the ventilating shaft. They were not worried so much about the subway per se, the Institute officials conceded, as about the blasting, pulling, and hauling. Gentlemanly observations on both sides, but they still left some uncertainty about the effects of the tunnel, and an irreducible obstacle: the ventilating shaft itself would have to be blasted out. A change in its location might add as much as $10 million to the city's costs on the $27-million tunnel. What was to be done?

Faced with such a dilemma, all political handbooks recommend a study by experts. The Institute and the Transit Authority agreed that experts—seismologists—should conduct experiments to determine the extent to which the scientists' fears were justified; and the TA agreed that "if the very real problems troubling Dr. Bronk turn out to be insoluble, we will of course reconsider our position." The cordial atmosphere broke down briefly when the Rockefeller Institute took its side of the story to the City Planning Commission and it got leaked to the press, but relations were quickly repaired.

Although an outsider cannot avoid the suspicion that the present state of good fellowship grows out of the fact that both sides fully expect the seismological researches to vindicate their own position, the researches nonetheless have been initiated. The seismologists, headed by Father Joseph Lynch of Fordham University, are basically trying to discover at what distance from the campus a subway tunnel would begin to increase the "noise" or vibration already experienced at the Institute. Soundings at the Institute which indicated at least some sensitivity to present street and river traffic, as well as to a distant earthquake and a construction blast, were completed last week.

The next step, just getting under way, is to take seismic readings at an operating tunnel on nearby 60th Street (which has geological characteristics roughly similar to the proposed new tunnel) to see whether it has any effect now on the Institute, and to gauge what the effects of the new tunnel might be. Readings will also be taken at various points between the institute and the tunnel, to determine the distance at which the effects become noticeable.

If disturbances from the tunnel are proved to increase significantly the vibrations felt at the Institute, presumably the Transit Authority is committed to redrawing its entire plan for the Queens-Manhattan tunnel. If not, presumably the seismologists will move on to the final stage of their calculations, an attempt to measure the effects of construction by setting off test charges in nearby holes, at varying distances from the seismograph, to find the spot closest to 64th Street where the blasting will not cause interference. All the facts turned in by the seismologists, however, will not make the delicate public policy question faced by the Transit Authority any easier. Nor, whatever the final verdict, will they alter the conviction of the Rockefeller Institute that good tunnels make bad neighbors.—ELINOR LANGER