systemic disease, through non-virus-producing and metastasizing cancerous lesions of the classical type, to regressing near-neoplastic lesions and (with the help of an adjuvant at subliminal doses) immunoproliferative reactions. Work which contributed to reproducibility had inadvertently selected for what proved to be a more rapidly acting "helper" virus, with which astute investigators were able to show that the Rous sarcoma virus genome is itself defective, and entirely dependent upon the genome of a "helper" for maturation to infectious form. It was found that any of the avian leukemia viruses could act as a "helper" and that the outer protective envelope of the defective sarcoma virus took on the properties of the "helper" agent. This accounted for the deviations in antigenicity encountered by chance in earlier investigations and made possible the fabrication in the laboratory of "pseudotype" strains of Rous sarcoma virus with predetermined antigenic specificity. The protein envelope was found also to determine the infectivity of the virus for specific genetic types of chickens. Moreover, helper-coded envelopes have been picked up by chance, as well as introduced in the laboratory, which enable the Rous sarcoma virus to cross species and induce malignant sarcomas in mammals, including monkeys.

The new insight into virus-host interactions, particularly the two-hit kinetics associated with the requirement of dual infection by related avian RNA viruses for the induction of virus-producing tumors, has brought new approaches to cancer-virus research and the search for similar viruses in other animal systems, including man. Already the story is repeating itself in viral-induced murine leukemias and sarcomas, once they had been brought to light by the use of immunologically tolerant test animals.

The virus discovered in 1911 still leads the way in research on the RNA tumor viruses. For his initial discovery and numerous fundamental contributions to the understanding of viral carcinogenesis, Peyton Rous has received six previous outstanding awards, including the National Medal of Science presented by President Johnson, and honorary doctoral degrees from seven leading universities throughout the world.

W. RAY BRYAN
National Cancer Institute,
National Institutes of Health,
Bethesda, Maryland

British Medicine: (I) Doctors Carry On but Show New Militancy

London. The current pay freeze in Britain, instituted by the government to curb inflation and improve the balance of payments, has had anything but a cooling effect on the tempers of junior hospital medical staff. Unrest has been expressed most overtly so far in a rising rate of emigration, particularly among doctors in the hospital service. To the British, this loss of expensively trained medical manpower is a particularly galling aspect of the brain drain.

Britain's junior hospital doctors are the counterparts of interns and residents in the United States. And there are striking transatlantic similarities in complaints about long hours, excessive patient loads, low pay, inadequate supervision by seniors, and haphazard training programs in many hospitals. As in the United States, hospital service in Britain has come to depend on foreign-trained doctors. In Britain a lot of these foreign-trained physicians are from less-developed Commonwealth countries. Many of these doctors never go home, and, in terms of manpower, for both the U.S. and Britain it is a case of robbing the poor to care for the rich.

There are, however, very significant differences between the hospital service in Britain and in the U.S. Existence of the National Health Service in Britain accounts, of course, for some of these differences, but the systems of postgraduate medical education in the two countries are distinct variants.

Discontent among junior hospital medical staff members in Britain was brought to a head by postponement of a raise granted them after negotiations last spring. The increase was due to start 1 April, but some points were still being negotiated in July when the government issued its pay "standstill" order. Because the raise had not actually gone into effect, the first payment at the new scale for the hospital doctors was deferred to 31 December. A few weeks ago the government announced that on that date the doctors would also get, retroactively, their increase for 3 months. The reaction of the young doctors, however, has generally been to regard government officials as Indian givers.

While pay was the precipitant, everyone involved in the case of the hospital doctors makes it clear that the trouble runs much deeper, involving the structure of British medicine and a history of underinvestment in medical services which goes back much farther than the two decades of the National Health Service's life.

The problem can only be discussed, however, in the context of the NHS. The government owns and operates the hospitals and employs all doctors who work in them. These doctors fall into two main categories: consultants (specialists) and junior medical staff. The juniors are divided into two groups, house officers and registrars, with each of these groups in turn divided into junior and senior grades. The housemen are roughly equivalent to American interns, and the registrars, to residents. All British medical school graduates spend at least two 6-month terms as junior house officers before they can be certified to practice, and most, including those going into general practice, serve in three or four of the 6-month posts.

The process of specialization in Britain differs sharply from that in the United States. In the U.S. the would-be specialist seeks appointment as a resident on a hospital staff and works under the direction of a chief of service. Posts are created according to the resources of the particular hospital or medical center and the wishes of the senior medical staff. After prescribed periods of service, candidates take examinations set by appropriate specialty boards. The successful examinee is free to set up in practice as a specialist.

His chances for admission to practice at a given hospital are good.

In Britain, ascent to the status of consultant depends not on examinations but on appointment to a particular consultant's post in a hospital. The profession—in this case meaning consultants—still controls appointments through an appointments advisory committee, although the Ministry of Health exercises ultimate authority by determining the number of consultants' posts and junior positions.

The average time required to attain the rank of consultant is generally longer than that required to reach specialist status in the United States. In Britain all appointments are competitive and, because the number of applicants exceeds the number of posts, are hotly contested. The trend toward specialization is strong in Britain as it is in the United States, and registrars not uncommonly continue to compete for consultant's appointments well into their forties. The long queue for consultants' appointments has been in part attributable to the very large number of medical school graduates produced in the "catch-up" years after World War II. However, while competition for consultants' posts has always been stiff, spokesmen for the junior staff argue that the number of junior posts in the hospital service have increased relatively faster than the number of consultants' posts, so that the bottleneck is even more constricting than in the past.

In certain popular specialties, such as general surgery and medicine, waits are longer and disappointments more numerous. In other specialties there are relative shortages of both junior medical staff and consultants, and for radiologists, pathologists, anesthesiologists, and ear, nose, and throat men, for example, the pace is swifter and competition less keen.

Concentration in Cities

Britain also has the sort of regional maldistribution of doctors that is familiar in the United States. The big cities, particularly London, are the magnets. In the North of England, climate and cultural conditions are bleaker and so are professional prospects. Appointments are easier to secure in the "peripheral" hospitals, but junior staff avoid them when they can. Facilities tend to be inadequate. Staff turnover is said to be generally high. Staff shortages are regarded as chronic, and overwork a condition of life. Under these circumstances the quality of the training obtained is suspect and chances of moving on to more desirable appointments are viewed as diminished.

The state of the hospitals themselves in Britain figures in the problem. Many hospitals date from the great age of Victorian public architecture, in which the main principle, illustrated in so many metropolitan railroad stations, city halls, prisons, and hospitals, seems to have been that form should whenever possible conceal function. After World War II, when population was soaring and medical techniques were changing drastically, funds for hospitals seemed to go mainly to patching roofs and plumbing and renovating operating theaters. National resources were very heavily committed to the construction of housing and new schools. The evidence of this commitment is clearly visible in almost every city and town in Britain, but until 1955 only about £10 million a year (the pound is equivalent to $2.80) went into hospital construction. Since the mid-1950's, and particularly in the last 5 or 6 years, spending on hospitals has increased very substantially—the rate has been about £75 million a year, according to government sources. So far the hospital building budget has escaped the current squeeze on expenditures, but the British are confronted with a problem of not only expanding a hospital capacity quite inadequate to meet current demands but of replacing, at the same time, an existing plant which is largely obsolete. Britain's medical service planners, therefore, must take into account the need for facilities as well as the demands of doctors already in practice and the nation's need for greater numbers of doctors, dentists, nurses, and other medical workers in the future.

In recent months, however, the focus has definitely been on pay for hospital doctors. There are some 9000 consultants and 13,000 to 14,000 junior staff in the hospital service in Britain—about 40 percent of them foreign-trained. (General practitioners number some 22,000, and the total number of qualified doctors in Britain is about 60,000, counting those working for local health authorities and industry and those holding administrative posts or not practicing because they are retired, are women raising families, or are following other pursuits, such as medical journalism.)

Under the new pay scale, consultants' annual pay for full-time work in the hospitals will rise, for the top grade reached after 3 years, from £4445 to £4885. Most consultants, however, combine hospital work with private practice. They are paid according to the number of "sessions" worked at NHS hospitals. There are 11 sessions a week—morning and afternoon Monday through Friday, and Saturday morning. To retain a hospital connection, a consultant must work at least two NHS sessions. If he works the minimum two sessions he is not paid for them. Many consultants, probably a healthy majority, earn more than the standard NHS annual remuneration. The average earnings are obviously well below those of their American counterparts but higher than the earnings of most academics and government officials in Britain and comparable to earnings of the upper, though not the top, grades in industry.

New Pay Scale

Under the revised scale, a junior staff man's pay will rise from the present £770 to £812 for his first year. The maximum pay for a houseman rises from £1300 to £1650. The maximum for a registrar, after 3 years of service, goes up from £1595 to £2050, and the maximum for a senior registrar goes up from £2165 to £2550.

Because the responsibility imposed on junior staff tends to increase progressively and because senior registrars must resign themselves to the prospect of long service in grade, the modest size of the pay increase in the top junior grades struck many of them as a last straw. In the protest movement among junior staff, much of the impetus and leadership has come from the registrars.

The first really organized expression of junior staff sentiment came last year when the government-appointed Review Body on Doctors' and Dentists' Remuneration was conducting the latest in a series of periodic investigations preliminary to advising the government on changes in pay and policy for doctors and dentists. Two groups representing junior staff opinion testified, one a group within the British Medical Association and the other a break-away "ginger group" which proposed, among other things, the dissolution of the BMA junior staff organization. It is spokesmen for the successor to this maverick action

group, now called the Junior Hospital Doctors' Association, who have taken the most militant line and have been quoted most frequently in the press this summer.

The junior hospital doctors were assisted in finding a forum this year by the fact that, for the first time, their case was considered separately. In the past, the profession was considered as a whole, and often percentage increases were awarded across the board. Last year higher remuneration was awarded general practitioners separately, and this year the system was revised to meet the criticism by the GP's that pay was not linked to work load.

General practitioners exerted pressure with a threat of mass resignation from the NHS. There is little doubt that the success of the GP's sharpened the hospital doctors' resentment over the postponement of their own pay increase, and it is equally clear that the lesson of the essay of the GP's in pressure politics was not lost on them. The juniors will not be satisfied with their raise alone, even when they get it.

Both the BMA junior doctors' group and the independent group are engaged in formulating proposals to be presented to the ministry. The independents are actively recruiting and are holding regional meetings, which they plan to follow up with a national meeting to get consensus on a series of proposals.

It is not difficult to predict the outline of the demands. In addition to low pay, grievances include bad food and squalid living conditions in hospitals and a requirement, especially affecting the most junior staff, to be on call literally any hour when not on duty. Many junior staff members, like others of their age these days, are married and have children. The complaint that junior staff can only do what is required of them professionally by shirking responsibility to their families has been heard often this summer. The young doctors have at the same time been unusually frank in saying that the long periods of duty inevitably result in fatigue in a degree that inevitably has fatal consequences for some patients.

Consultants are already under criticism from the juniors—first, because they are so frequently simply not there when an emergency has to be dealt with; second, because the consultants collectively have done too little to correct the fundamental problems of the hospital service and provide better pro-

NEWS IN BRIEF

● **METRIC SYSTEM**: For the second straight year, legislation aimed toward U.S. adoption of the metric system is locked up in the House Rules Committee. Time is running out in Congress, and few hold any hope that the Rules Committee will allow the measure to reach the floor this session. In February, the House Science and Astronautics Committee reported, with a minor amendment, a Senate-passed bill (S. 774) authorizing the Secretary of Commerce to undertake a 3-year study of the feasibility of adopting the metric system in the U.S. The same House committee in August of last year reported a similar bill, but the Rules Committee deferred action on it.

● **OCEANOGRAPHY**: A further sign of the federal government's steadily mounting interest in this field is the Navy's recent announcement that the Oceanographer of the Navy, Rear Admiral Odale D. Waters, Jr., will exercise central authority over the Navy's entire oceanography program. The oceanographer formerly exercised largely a liaison function. He coordinated the oceanographic work of the Office of Naval Research and the Navy's technical bureaus (such as the Bureau of Ships) with that of his own office, which has consisted mainly of applied research in support of the antisubmarine warfare program.

● **SCIENCE WITH MAO**: *Hsinhua*, the Communist China news agency, reports the following on the 1966 Physics Colloquium recently held in Peking, and reportedly attended by 144 scientists from 33 countries.

"The report delivered on behalf of the Peking research group into the theory of elementary particles, and related papers presented, showed results achieved under the brilliant philosophical thesis of Chairman Mao Tse-tung that everything in the world tends to divide into two. The report creatively postulated the 'theory of the straton model' which reflects the internal structure of elementary particles, showing that the elementary particles are composed of still more elementary things —stratons and antistratons—and thus taking a great step forward in theoretical research into the internal structure of elementary particles. . . . In his report, Tsai Tsu-chuan, worker-expert in electric light sources and deputy head of the Chinese Scientists Delegation to the colloquium, described how he started his research work from scratch, guided by Chairman Mao's two philosophical essays—'On Practice' and 'On Contradiction'—and eventually introduced a dozen or so new types of electric lights. . . . The Guinean scientist Diallo Saidou said: 'All the reports and papers read by the Chinese scientists at the colloquium showed results arrived at under the guidance of Mao Tse-tung's thought.' . . . One of the scientists pointed out that, in the past, many big international meetings became places where people showed off results of their own individual scientific research. Here in Peking a cordial atmosphere of unity and cooperation prevailed."

● **APPOINTMENTS**: Otis A. Singletary, chancellor of the University of North Carolina at Greensboro, to vice president of the American Council on Education. Singletary succeeds Allan M. Cartter, who resigned to become chancellor of the New York University. . . . General James Ferguson, deputy chief of staff for research and development at U.S. Air Force headquarters in Washington, to head of Air Force Systems Command. General Ferguson succeeds General Bernard A. Schriever, who recently retired. . . . Mary W. Lasker, president of the Albert and Mary Lasker Foundation, to a 4-year term on the 12-member national advisory council of the National Institute of General Medical Sciences. . . . Earl Ubell, science editor of the New York *Herald Tribune* since 1953, to CBS, where he will be science editor of WCBS-TV News in New York City. . . . Werner Baum, vice president for scientific affairs at New York University, to deputy administrator of Environmental Science Services Administration. He succeeds Vice Admiral H. Arnold Karo who will retire 1 January . . . . Gerald V. Howard, head of Bureau of Commercial Fisheries' Tuna Resources Laboratory at La Jolla, California, to director of the Pacific Southwest Region of the Bureau at Terminal Island. He succeeds Donald R. Johnson, who left to assume a similar position with the Bureau's Pacific Northwest Region in Seattle.

grams of postgraduate training and an organized program of career guidance for juniors.

All these criticisms are only too recognizable as home truths about the U.S. situation as well. What the young militants seem to find particularly frustrating in Britain is the fact that final responsibility seems to reside nowhere. Particularly after the events of the summer, the junior staff are inclined to place the blame on the Ministry of Health, which one active militant referred to as "the last enemy."

The ministry, for its part, has sought to interfere with the profession as little as possible. Authority over hospitals is decentralized, with planning and budgeting responsibility delegated in large part to 15 regional hospital boards. Local management boards responsible for individual hospitals or groups of hospitals constitute another administrative layer. Members of these boards are appointed by the Minister of Health, and although some medical members are included at both levels, the junior doctors argue that the appointments are made either to grant an honor or bring in the representative of some interest, such as the trades unions, and that the boards therefore are both amateur and political.

The junior medical staff claim that the diffusion of responsibility makes it impossible for them to have any real effect in improving either the conditions under which they work or the quality of the services they provide. What they feel they have achieved so far is recognition by both the BMA and the government that they should be directly represented not only in negotiations over pay but in formulation of policy which affects the hospital service.

In the past, a joint consultants' committee, drawn from the membership of the BMA and the specialty groups, has done the negotiating for all grades of hospital staff. Last year one junior doctor was appointed to the body, and the BMA's influential Central Consultants' and Specialists' Committee will probably soon broaden its own representation of juniors. But the young doctors are pressing for a more direct voice.

Inevitably, government officials emphasize what has been done to strengthen the NHS while the critics stress what needs doing. It should be noted that government officials seem pleased at the initiative being taken by the junior staff, since many of the things that worry the young doctors worry ministry officials more than the consultants realize.

What the junior doctors can do and will do next is not clear. There have been some scattered suggestions that junior staff hold only to formal working schedules, and, since overtime is the rule, the result would necessarily be cutbacks, in some places drastic, of important hospital services. Such talk has been dampened, both because the doctors themselves take pride in the service they provide and because any slowdown could dissipate the present considerable public sympathy for their cause.

Perhaps the junior doctors' greatest leverage lies in the emigration figures.

—JOHN WALSH

(A second article in this space will discuss this matter of emigration, which some serious observers now claim puts the National Health Service itself in jeopardy.)

Smale Aftermath: ICSU and Academy Urge Ban on Politics at Meetings

There have been a number of developments in recent weeks at least in part connected with the affair of Stephen Smale, the Berkeley mathematician who, while on NSF subsidy, stood on the steps of Moscow University and berated both the United States and the Soviet Union (*Science*, 7 October).

First of all, as a consequence of Smale's activities and other political outcroppings at international scientific meetings this summer, two prestigious scientific organizations have issued pleas that scientists refrain from political activity at such meetings. These pleas were embodied in resolutions adopted 2 October in Washington by the 16-member council of the National Academy of Sciences (NAS) and a few days later, in Monte Carlo, by the executive committee of the International Council of Scientific Unions (ICSU). The ICSU committee consists of 33 members, including representatives from scientific organizations in the United States and the Soviet Union.

Neither organization made specific reference to the source of its concern, but clearly both resolutions were inspired by efforts, at scientific meetings in Moscow during the summer, to drum up protest against the U.S. role in Vietnam. In the case of the ICSU statement, it was pointed out that the tradition of excluding politics from scientific meetings has enabled ICSU "to exert considerable influence in order to ensure the free movement of *bona fide* scientists to attend scientific meetings anywhere in the world." Which is perhaps another way of saying that, if international congresses become a place to score political points, cloak-and-dagger spooks from East and West can reasonably be expected to crowd in and seek to manipulate the proceedings.

NSF, which is a very small boat on the seas of national politics, has regained its composure after a touch of panic over the Smale affair, and is honorably, though quietly, standing by the principle that, by Act of Congress, it is concerned only with the professor's mathematics, not his politics. Representative Richard L. Roudebush (R–Ind.) announced last week that he "will explore the possibility of drafting individual legislation to block Smale's grant for next summer and also, when the 90th Congress returns in January, seek a House Committee on Science and Astronautics review of the National Science Foundation's procedures for awarding grants and fellowships." No one sympathetic to the Foundation wants to inflame "Roudy," as his congressional colleagues affectionately call him. But inquiry suggests some similarity between his proclamation and