an unusual variant of juvenile rheumatoid arthritis or an infectious arthritis,'' and to realize ''that at that point it became clear that it was beyond my realm of expertise.'' He called for reinforcements.

The pieces of a puzzle were becoming evident. He needed help to try to find more pieces before an attempt could even be made to fit them together. Stephen E. Malawista, Chief of Rheumatology and Allen C. Steere Jr., postdoctoral fellow in Rheumatology, both of Yale, were presented with the clues: Three to four weeks before the initial swelling, which is usually mild and intermittent, a semicircular skin lesion or a rash appears, the kind previously associated with tick bites. The outbreaks have been clustered temporally (appearing in the summer or early fall) and geographically (Lyme and nearby towns). Though there were several cases within one family and among neighbors, they sometimes started in different years, making it unlikely that the disease was transmitted from one person to another. ''Most of those with the illness lived in sparsely wooded areas,'' commented Steere. ''Half of those affected in Old Lyme lived on two adjoining roads as did half of those affected in East Haddam.''

Studying these hit-or-miss epidemiological patterns led the Yale researchers to believe that Lyme arthritis might be caused by a virus transmitted by insects or arthropods. Ticks, mosquitoes and black flies are under suspicion.

Infectious forms of arthritis are not new. Over the last three years mosquitoes have been shown to transfer several different kinds of arthritis. Among them are the chikungunya and o'nyong'nyong arthritides in Africa. A kind of arthritis called Reiter's syndrome often follows an attack of dysentery.

But according to Steere, Lyme arthritis does not follow the usual form. It looks and acts as though an infection is involved, but so far, laboratory tests have ruled out all agents known to cause arthritis symptoms, and other infectious agents. Communal sources of infection such as food, drinking water and shared swimming places have also been ruled out.

Lyme arthritis may be the first form of the disease in America to be transmitted by an insect. Malawista sees the symptoms of the enigmatic disease as giving researchers ''the opportunity of seeing in the laboratory, arthritis, which we think is caused by an infection, from the very beginning. That rash might be the tip-off for exactly when this thing is occurring. The general value,'' he says, ''is getting to see the patients at the onset of the disease . . . that's the time when we'll be most likely to find the agent.''

Contributing to the efforts of those trying to define Lyme arthritis are Yale entomologists. Conducting a formal taxonomic study of insects prevalent in the areas affected will enable them to formulate an extract from the ground-up insects. This sludge will be added to tissue cultures, and if any viruses or suspicious organisms grow out of that, they will test the sera of persons who had Lyme arthritis and who would presumably have antibodies. If the sera of infected persons respond, the infectious agent can then be isolated.

Malawista stresses that the Yale group's first responsibility is to the patients. Although the evidence is still inconclusive, ''the fact that we haven't gotten it yet doesn't discourage us,'' says Malawista. Hoping to identify the disease beyond a doubt, they say they will continue to seek ways of isolating the agent until all of their questions have answers. □

New compound for male contraception

The discovery of potent antispermatogenic activity from a group of synthesized drugs marks the latest thrust in efforts to find an effective male contraceptive. Although the female has long been the focus of most contraceptive development research, a decade ago scientists began directing their studies toward her masculine counterpart (SN: 11/4/67). A major part of the argument for this redirection of efforts is that the male systems for producing the sex hormones and sperm cells are essentially separate. This means that a drug inhibiting a man's ability to produce sperm needn't also affect his libido or masculine traits.

Research in the field has produced numerous schemes for repressing the intended mission of the male sperm, and they are generally results of two distinct philosophies of approach. On the one hand there are scientists seeking to prevent the sperm's penetration into the egg (SN: 2/24/73, p. 124), and then there are those trying to disable the production of sperm altogether. It is with the latter intent that the recent discovery reported in the June issue of the JOURNAL OF MEDICINAL CHEMISTRY was made.

G. Corsi, G. Palazzo, C. Germani, P.S. Barcellona and B. Silvestrini from the F. Angelini Research Institute in Rome studied the effects of numerous 1H-indazole-3-carboxylic acids and their derivatives on male rats. Some of the compounds interfered with sperm production by mutilating and destroying the spermatocytes and spermatids, immediate precursors to the actual semen. Furthermore, the activity occurs without apparent damage to the sperm-transporting tissues.

The authors claim that a significant advantage to these compounds is their relatively high potency and selectivity. While previously discovered agents often require large and repeated doses to work and still others are indiscriminate in their effect, the recently found chemicals initiate their specific effect after a single dose. They report that even with the largest doses administered to the rats, toxic effects remained minimal.

''There have been many other compounds which looked all right in the rat,'' but which later proved ineffective or worse in the human, says Gabriel Bialy, chief of the contraceptive development branch of the National Institutes of Health. Although he cautions that many past ideas which ''excited the research community'' have since been discarded, ''I wish that what they say [for rats] turns out to be true.''

Among the questions left unanswered by this study is whether the drugs' effects are permanent. Many encouraging ideas of the past suffer in this one crucial respect. Some methods that induce infertility by applying heat in the form of microwave, infrared and ultrasound radiation directly to the testes (SN: 5/11/74, p. 309) produce effects lasting up to seven years. Over 2.5 million men, however, have acquiesced to one of the most permanent forms of contraception, a vasectomy.

Since no antispermatogenic activity has ever been observed in this chemical class before, the scientists claim that in addition to the possible social applications, ''a completely new field of chemical research has been opened.'' □

TM: Understanding the rest of it

Stress has become a common word and a common worry in recent years because of its association with heart disease, ulcers and psychological problems. TM (transcendental meditation) has become a common practice for almost one million people in the United States because, among other things, it seems to relieve stress. But early this year, researchers reported that the beneficial effects of TM might be the result of sleep during meditation, rather than meditation itself (SN: 1/24/76, p. 54). Now it is reported that rest (being seated quietly with the eyes closed) may be responsible for the physiological changes that accompany TM. This conclusion is based on measurements of catecholamines, body chemicals associated with stress.

Trained meditators (most of whom were qualified TM teachers) were compared with control subjects unfamiliar with the techniques of TM. Blood samples were taken before, during and after meditation periods, which lasted from 20 to 30 minutes. Control subjects went through the same procedure, except they sat quietly with their eyes closed instead of meditating. R. R. Michaels, M. J. Huber and D. S. McCann of the Wayne County General Hospital and the University of Michigan report in the June 18 SCIENCE that ''essentially the same results were obtained for the two groups.'' The small changes noted in catecholamine levels could,

therefore, have been the result of sitting quietly.

Whether or not the subjects were meditating properly is difficult to determine, but all subjects were trained and reported having had a "good" meditation. It follows, say the researchers, "that, while a psychological benefit may be derived by its practitioners from the act of TM, it cannot be expressed in terms of the biochemical parameters measured by this study." They suggest that "meditation does not induce a unique metabolic state but is seen biochemically as a resting state." □

℞ education: Back to basics (sort of)

After six years of conducting surveys that have shown American students and adults sadly deficient in knowledge of the world around them and in the fundamental skills of citizenship and daily life, the Education Commission of the States (ECS) has offered a tentative prescription to remedy the situation: Teach more "basics," but carefully choose which ones.

Indeed, part of the problem appears to be overemphasis on some "basics" at the expense of others. Educators from a National Council of Teachers of Mathematics panel asked to review the ECS results cautioned against "more overemphasis" on simple computation and urged a sharper focus on solving percentage and consumer problems. Similarly, University of Southern California English professor W. Ross Winterowd sees no need to increase work on spelling and punctuation, but he worries about "the strong evidence that coherence and the ability to develop ideas [in composition is perhaps] evaporating."

Such conclusions are fraught with irony, since most of the pedagogical changes of the last decade or so have aimed at increasing "understanding" while sparing the student repetitive exercise. The changes have aimed at lowering cultural barriers, but Winterowd sees instead a "greater polarization of abilities [that is] perpetuating a cultural elite." Finally, in an age of supposed sexual frankness, it is particularly ironic that one of the weakest areas of scientific knowledge among 17-year-olds is human reproduction—only 3 out of 10 students correctly answered a question about the menstrual cycle and only about half knew that an embryo develops in the uterus.

In science, as in the other fields, academic knowledge appears to be strangely disjointed from the rest of life in the student's mind, despite increased talk of "relevance." Two-thirds of 13-year-olds know that seeds come from the flower portion of a plant and even more can identify the function of lungs and nerves, but a majority still believe one should apply cold packs to a person who has fainted, which could actually prove harmful (the person should be kept warm).

The ECS message can be underscored perhaps most poignantly by simply reproducing a brief essay by a 13-year-old (recalling that "literacy" is sometimes defined as a sixth or seventh grade reading and writing level): "A dog is a anemal and does have a bran. Haves big teeth, a nose that he can smell with. A dog, it come in all size, a dog wake on four legs. A dog have two eye, he has ears and has hair. This dog can see good at night."

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In a separate development, the Carnegie Council on Policy Studies in Higher Education has released a study outlining university curriculum changes over roughly the last decade. Its main conclusion: So-called "general education"—courses required of all students to assure a rounded background—has significantly declined, from 43.1 percent of the undergraduate curriculum to 33.5 percent.

Science and mathematics have been particularly hard hit. The proportion of institutions requiring mathematics has dropped from 33 to 20 percent. Students have tended to use their elective options to take social science courses rather than study the natural sciences, apparently because the latter are considered more difficult and because of "the loss of the high status of science during the middle and late 1960s." □

Academic research data confidential

In a unique legal case, a U.S. District Judge in San Francisco has upheld the right of a Harvard professor to maintain the confidentiality of information obtained in the course of his academic research. The data in question were accumulated by Marc J. Roberts, professor of political economy, on the manner in which public utilities make environmental decisions.

The plaintiff, a company which supplies environmental equipment, claimed, among other things, that it had been defamed in the course of interviews conducted by the professor with employees from Pacific Gas and Electric. Prior to the interviews the Harvard scholar had written a pledge of confidentiality to the California utility.

Daniel Steiner, general counsel for Harvard University, believes the court's ruling to protect academic research data is without precedent. In his decision, Judge Charles B. Renfrew said, "Society has a profound interest in the research of its scholars . . ." and "compelled disclosure of confidential information would, without question, severely stifle research into questions of public policy. . . ." It is likely the decision will primarily affect the social scientist, whose type of research is most vulnerable to conflicts of this sort. □

Math 'conflict' long resolved

Contrary to assertions made in several publications recently, there is no dramatic mathematical dilemma in homotopy theory. Recent reports advertised that a theorem in that discipline had been proven by one pair of mathematicians and disproven by another—what a June 2 New York Times editorial chose to call a "crisis in mathematics." The editorial was apparently inspired by an article in the June 4 SCIENCE which claimed that the contention is an outstanding problem in mathematics. Actually the "dispute" was transitory and has been resolved since July 1974.

Homotopy theorists are generally concerned with studying curves and surfaces that are related through a continuous deformation process and their properties which survive the transformation unaltered (so-called "invariant properties"). The surfaces so related, such as all the closed curves that can be drawn on the surface of an ordinary sphere, constitute a "homotopy class." The ensemble of all such classes in a given dimension in turn form a "homotopy group." The theorem in question involves homotopy groups of spheres (relevant to spherical surfaces).

The theorem's proof, which was ultimately vindicated, is due to Emery Thomas of the University of California at Berkeley and Raphael Zahler of Rutgers and was published in the JOURNAL OF PURE AND APPLIED ALGEBRA in early 1974. Meanwhile, Shichirô Oka of Kyoto University and Hirosi Toda (a leading contributor in this field) of Hiroshima University had written but not published a conflicting "disproof." The discrepancy centered around their claim that one of the group elements in the proof was equal to zero. The original proof was later corroborated by J. Frank Adams of the University of Cambridge after which the Japanese mathematicians found an error (July 1974) in their work and published the final results in the HIROSHIMA MATHEMATICAL JOURNAL (5:115) in early 1975. In the article's introduction the authors acknowledge, "the publication (of this paper) has been postponed by a contradiction to the result of E. Thomas and R. Zahler. We have reexamined our original proof, and after crucial investigations we have concluded the opposite result."

The "dispute," what there ever was of one, is not unlike the initially conflicting results often obtained in the midst of scientific research, Zahler says. Recent publicity blamed the "crisis" on exceedingly long and esoteric proofs which it claimed were becoming typical in mathematics; "ours just took 13 pages," Zahler explains. He has sent letters of rebuttal to bot the New York Times and SCIENCE magazine. □