Cellulose between the stars: Excelsior

With hydrogen, carbon, oxygen and nitrogen as abundant elements in interstellar space, the chemistry of the molecules there tends to get more and more organic as it gets more and more complex. Not so long ago, radio astronomers reported the discovery of a molecule with a molecular weight as high as 99. Several groups are avidly searching for the simplest amino acids. Now, from a contemplation of infrared observations, comes a suggestion of a somewhat different kind of large organic molecule. Would you believe cellulose?

In the Aug. 18 NATURE Fred Hoyle and N. C. Wickramasinghe of University College, Cardiff, suggest that formation of polysaccharides, a class of polymers of formaldehyde, of which cellulose is one, might be facilitated as the interstellar gas clouds go through alternate stages of compression and evaporation. Observationally, Hoyle and Wickramasinghe compare recorded celestial data with both the infrared transmittance characteristic of cellulose and a curve that they estimate for an ensemble of polysaccharides and find them relatively congruous.

Formaldehyde is one of the most abundant and ubiquitous of the interstellar compounds. It is a fairly fragile compound, and Hoyle and Wickramasinghe suggest that its formation tends to be facilitated as the interstellar clouds condense and that it probably tends to dissociate as the clouds disperse. However, the polymers of formaldehyde tend to be more resistant to breakup than formaldehyde itself. The most resistant class is the polysaccharides, and they seem to have a good chance to survive in interstellar space.

But that does not say that the polysaccharides are there. The infrared transmittance characteristics of interstellar space have usually been attributed to silicates and water ice, which have the advantage of being simpler materials. Yet, Hoyle and Wickramasinghe point out, the measured infrared characteristics of those substances do not correspond well to the spectra of a variety of infrared sources in various parts of the galaxy. This failure is "more disturbing" because the simplicity of ice and silicates leaves little scope for their properties to be changed by local conditions. A generalized calculation of the infrared transmittance of polysaccharides based on the measured properties of cellulose seems to get around some of the difficulties of the ice-silicate model, and it fits the observations for the Trapezium nebula. And so, Hoyle and Wickramasinghe conclude, "We consider that a *prima facie* case for the existence of interstellar polysaccharides has been established." □

Integration: More preventive than cure

Would the white high schoolers of South Boston have gotten along better with their black counterparts from Roxbury if the groups had been integrated back in kindergarten rather than as teenagers? There's no way of knowing for sure, but a newly reported study indicates that children who start out in desegregated schools to develop better attitudes toward and relationships with classmates of a different race than do students whose classes were segregated before their school became integrated.

"Our data are the most encouraging I've seen in terms of cross-race relations [in school]," educational researcher Steven R. Asher told SCIENCE NEWS. The data, he adds, "lend support to the idea that starting [integration] early is a good thing to do."

Asher and Louise C. Singleton, both of the University of Illinois at Urbana-Champaign, analyzed the attitudes of 179 white and 48 black third graders in one Illinois school system. The researchers also directly observed the activities of 39 white and 39 black children in the same system. All the students had been in integrated classrooms since starting kindergarten.

Most previous studies of integrated schools have yielded "a somewhat negative picture of the impact of integration," the authors note in reporting their research in the August JOURNAL OF EDUCATIONAL PSYCHOLOGY. "Most of the research, however, has been conducted with children who were in recently integrated classrooms or who had a prior history of segregated schooling."

In addition to being aimed at children who have experienced "only integrated education," the Illinois study differs from most previous research in its method of assessing student attitudes toward each other. Rather than ask each student with whom they most preferred to be (the common question posed in many other studies), Asher and Singleton had each youngster rate *all* classmates on a five-point scale. This decreases the likelihood of a child momentarily forgetting another student, or not knowing how to spell the classmate's name; it also provides a "more reliable" indication of acceptance, the researchers say. "Maybe we've been too idealistic in what to expect" from integration, Asher says. "Maybe it's enough if they just like each other," rather than being best friends, he says.

Results from the questionnaires and 50 observations of each child on two separate school visits show that: Race had little to do with how youngsters rated one another. Blacks rated whites only slightly, but not significantly, lower than they rated blacks, and vice-versa; there was essentially no difference in the occurrence of positive interactions between and among races.

Moreover, sex was found to be a far greater influence than race on the third-graders' attitudes. Among all students—white and black, male and female—ratings of the opposite sex were consistently and considerably lower than ratings of the same sex. "Children's liking [or disliking] of one another was not influenced very much by race but was strongly influenced by sex," report the researchers.

Though just reported, those data were compiled in 1973. The Illinois researchers have recently completed a three-year follow up on the same youngsters, now in the sixth grade, Asher said in an interview. Those results, to be presented at the American Psychological Association meeting this week, show a slight increase in race bias but "still not an enormous effect," according to Asher. Although biases appear to be "getting stronger," they are still not as prevalent as with many other peers who have not experienced totally integrated schooling.

Asher speculates that some of the reasons for the discernible, if slight, deterioration in race relations may have to do with the increased fears that parents relay to the youngsters about social relations such as dating as the children grow older. Divergent home value systems of the youngsters might also be surfacing at this age, he suggests.

But overall, Asher concludes, the results of the original and follow-up studies paint a more positive picture than those of past research. While some of the difference must be attributed to use of a different rating scale, Asher also believes that early integration plays a part.

"I would hope so," he says. "If anyone wants to see some reason for optimism in the world, [our] data would provide it." □

China's quake forecasting: 50-50

The world's second worst earthquake, which devastated the Chinese city of T'angshan on July 28, 1976, was also notable in another respect. The disaster was unforeseen in its imminent stages by the Chinese earthquake-prediction network, whose success with a major 1975 quake has since been widely reported. (The worst quake occurred in China's Shensi province in 1556.)

But 1976 wasn't all bad for Chinese seismologists—quite the contrary, in fact. Last year the Chinese managed to predict three of six major tremblers (magnitude greater than 7), according to a recent Chinese disclosure as recounted by geophysicist Robert L. Wesson of the U.S. Geological Survey. Wesson says Chinese scientists reported last year's

successes at a Paris meeting that convened to plan a worldwide conference on all aspects of earthquake prediction, social and scientific. The meeting was sponsored by the United Nations Educational, Scientific and Cultural Organization.

The three quakes were each near magnitude 7 (about one-tenth the intensity of the 1906, magnitude 8.3, San Francisco quake). They occurred on May 29 in Yunnan province, on Aug. 16 in Szechuan province and on Nov. 7 in a Szechuan-Yunnan border region—all three confined to southern and south-central China. In each case, a medium or long-range forecast was made privately. Although the public wasn't informed directly, each prediction was followed by extensive planning, preparation and public education.

The preliminary prophecies followed measurements of significant departures from ordinary patterns of earthquake activity and various other observations of the earth's surface contour and magnetic field. In general, and a key element in China's successful predictions, says Wesson, "is a 'grass roots' effort, [whereby] tens of thousands of amateurs assist in the observational activities, which include the monitoring of water levels in wells, recording variations in ground tilt and electric currents in the ground on instruments in villages, and even the reporting of animal behavior." Wesson's description is consistent with other accounts previously made public (SN: 5/1/76, p. 277).

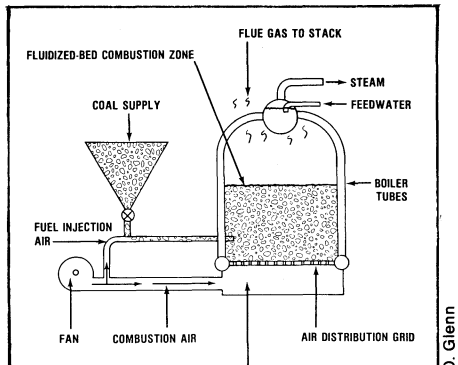
Before each of the three tremblers—usually a day or several hours before—a public warning was issued. The careful preparations that were precipitated by the initial prediction enabled the Chinese people to respond in an organized fashion, including the systematic evacuation of hazardous buildings. According to the Chinese scientists, thousands of lives were saved as a result.

Although there has never been any official U.S. government earthquake prediction, there have been a number made—with some successes—by individual scientists, usually of minor tremblers. A critical aspect of earthquake (like weather) forecasting, concerns societal reaction to false alarms. A few years ago, a California seismologist who openly ventured a calculated prediction incurred the wrath of many citizens who charged him with risking a public panic. When asked about the Chinese attitude toward the several admitted false alarms that were issued them last year, Ting Kuo Yu of the State Seismological Bureau in Peking replied that some people complained, but that on the whole, the Chinese people would rather respond to many false alarms than suffer the consequences of an unpredicted earthquake. □

Fluid-bed combustion: A sleeper awakes

Fluidized-bed coal combustion is a lackluster, albeit advanced energy technology that might still be asleep were it not for the Clean Air Act and its threat of crippling Ohio's coal mining industry. Last year, the U.S. Environmental Protection Agency told Ohio officials that because they had been delinquent in meeting sulfur dioxide standards, EPA would do it for them. A resulting dictum—use stack-gas scrubbers or burn low sulfur coal—tolled an ominous message to the 14,000 people who mine Ohio's coal; an estimated half would lose their jobs with a statewide shift to low sulfur coal. Since scrubbers have a notoriously bad reliability and cleanup record with Ohio's particularly dirty coal, state officials offered an alternative: demonstration of fluidized-bed combustion, beginning with four commercial boilers, the first due to begin operation late next year.

The fluidized-bed concept exploits the fact that air blowing through a perforated plate will agitate particles above the plate, making them behave much like a fluid. This permits burning coal of any type—lignite to anthracite—perhaps with as much as a 4 percent increase in thermal efficiency. Because burning occurs at a lower temperature than in normal boilers, nitrous-oxide emissions are reduced to well below EPA standards. And sulfur can be eliminated by mixing a ratio of four parts coal to one part limestone; sulfur combines with inert limestone instead of going up the stack. The limestone can be removed for use as a soil nutrient—as Ohio plans—or to regenerate clean limestone and salable sulfur.



R. D. Glenn

Cleaner burning is not its only asset.

Eric Johnson, energy specialist for Ohio's energy agency said that this is the only way to burn Ohio coal and meet federal air-pollution standards. He says Ohio's governor, James Rhodes, is already talking about an eventual 600 or more fluidized-bed boilers for that state.

Although fluidized-bed research in this country is almost two decades old, the technology has attracted little attention, mostly due to its unglamorous appeal. And the wealth of cheap energy alternatives—now dwindling rapidly—put no heat under the burner to expedite its progress. Therefore, when Ohio decided fluidized-bed was the way to go, it had to go far—literally across the ocean to England—to find the experience, capability and commercial guarantees that fluidized-bed boilers would perform as well as conventional ones.

Where is fluidized-bed research in this country? On Aug. 26, the first commercial-scale plant will be dedicated in ceremonies at its Rivesville, W. Va., site. The plant began operation last December but its design is still one to three years from commercialization, depending on how quickly problems in coal-handling equipment can be overcome. Walt Saunders, of the Energy Research and Development Administration's coal combustion and utilization branch, explains that a fine powder shakes off coal particles and settles to the bottom of the conveyor feeding the combustor. Accumulation of powder softens the vibrations that send coal moving, impeding the rate at which it moves; eventually, the whole system can get plugged up.

Another type of fluidized-bed combustion involves burning coal in a high pressure—six to ten atmosphere—environment for much better thermal efficiency. That process is significantly more complicated and lags several years behind the nonpressurized version in overcoming engineering obstacles. Its overriding advantage is that it would permit combined-cycle generation of both steam and electricity, making it ideal for use by large electric utilities. □

NASA patents cell control method

A pharmaceutical dial to turn up or down the rate of human cell division would be a powerful tool for medical scientists. They could then stop the rampant proliferation of cancerous cells and coax mature, nonreplicating nerve cells to reproduce to make up for loss from injury or senility.

The National Aeronautics and Space Administration has now received a patent on a process that appears to control cell division. Experiments in their laboratories have indicated that various methods of changing ion concentrations inside a cell alter the rates of replication.

Clarence D. Cone Jr., now at the Veterans Administration Hospital Center in Hampton, Va., first proposed this process while studying effects of space radiation on living cells. He noticed that cells with large electrical gradients across their membranes, such as nerve and muscle, seldom if ever divide, while cells with small electrical gradients divide rapidly. Subsequent experiments demonstrated that the controlling factor was not the electrical gradient itself, but rather