presumably present in most quasars.

The popular association between redshift and distance derives from an apparent, direct linear correlation, first noted by the American astronomer Edwin P. Hubble in 1929, between the distances of certain celestial objects and the speeds at which they are receding from us (and every other point in the universe for that matter). Using telescopes—in this case optical ones—astronomers can infer a body's recession speed by measuring the amount by which its radiation is shifted toward the red end of the spectrum; the amount is assigned an index value, z.

The two authors, reporting in the July 15 ASTROPHYSICAL JOURNAL, note that the six quasars were selected from a larger assortment recently observed using Cerro Tololo's 1.5- and 4-meter telescopes, outfitted with a special prism spectrometer. The astronomers' goal is to infer the prevalence of high-redshift quasars in the sky from those seen.

The fifth high-redshift quasar (Q1402+044) was identified by David L. Jauncey of the Commonwealth Scientific and Industrial Research Organization in Australia and Phillip Hicks and James J. Condon of Virginia Polytechnic Institute and State University. Their discovery will be announced in a forthcoming issue of ASTRONOMICAL JOURNAL.

Although many quasars of all redshifts surely remain undiscovered, there were 637 in the latest published list of February 1977 (AP. J. SUPPLEMENT, 33:113). □

Language in deaf children: An instinct

The acquisition of language has always been one of the more intriguing aspects of childhood development. "The child of English-speaking parents learns English and not Hopi, while the child of Hopi-speaking learns Hopi, not English," note Susan Goldin-Meadow of the University of Chicago and Heidi Feldman of the University of California at San Diego School of Medicine.

"But what if a child is exposed to no conventional language at all?" the researchers ask in the July 22 SCIENCE. "Surely such a child, lacking a specific model to imitate, could not learn the conventional language of his culture," they say. "But might he elaborate a structured, albeit idiosyncratic, language nevertheless? Must a child experience language in order to learn language?"

In attempting to answer that question, Goldin-Meadow and Feldman videotaped six deaf children in their homes for one to two hour sessions at six- to eight-week intervals. The 17- to 49-month-old children—four boys and two girls of "normal intelligence"—had not been exposed to manual sign language because their parents wanted to expose them to oral education. Yet none at that point had acquired significant knowledge from their oral-education program.

The youngsters were observed and taped during informal interactions with a researcher, their mother and a standard set of toys. The researchers found that the deaf children "developed a structured communication system that incorporates properties found in all child languages. They developed a lexicon of signs to refer to objects, people and actions, and they combined signs into phrases that express semantic relations in an ordered way."

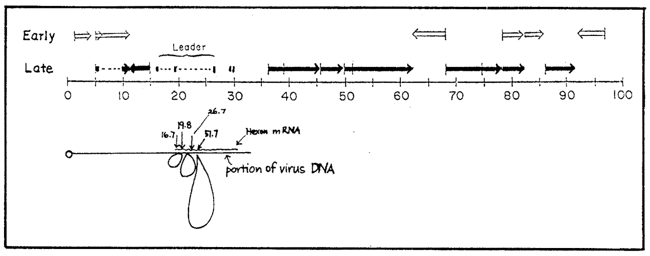
Perhaps most importantly, the experimenters found, through a complex coding system, that it was indeed the children, and not their parents, who actually devised the communication system. Though the mothers did use "some gestures" in their interaction with the youngsters, "a comparison of the mothers' and the children's signs suggests that indeed it was the children who first produced the system," report Goldin-Meadow and Feldman. Only 25 percent of the signs produced were common between mother and children, and there was "no evidence" that the children were imitating their mothers, say the researchers.

The deaf youngsters' systems were composed of:

- Lexicon. Two types of signs were developed to refer to objects and actions. For example, they would point to signify words such as "this" or "there." Or, a closed fist bobbed in and out near the mouth referred to a banana or the act of eating a banana; hands flapped at shoulder height referred to a bird.
- Syntax and Semantics. The children linked their lexicon into multisign phrases that conveyed relations between objects and actions. For instance, one child pointed at a jar and then produced a twisting motion in the air. Another child opened his hand with his palm facing upward and then followed this with a "give" sign with a point toward his chest.

"We have shown that the child can develop a structured communication system in a manual mode without the benefit of an explicit, conventional language model," the researchers conclude. They compare the findings with the "meager linguistic achievements of chimpanzees," where chimps have been shown to develop languagelike communication, but only with training. "Even under difficult circumstances, however, the human child reveals a natural inclination to develop a structured communication system," say Feldman and Goldin-Meadow. □

Animal genes do it differently



Adapted from Louise T. Chow et al. and Nature

DNA loops reveal spliced nature of messenger RNA for an animal virus protein, hexon.

Geneticists were recently amazed, fascinated and bewildered by results relating to how information in DNA is conveyed to the protein factories of the cell. Years of experiments on bacteria and their viruses had produced a clear model: The information carrier, messenger RNA, is copied from a continuous stretch of DNA. The copy begins with a start signal, continues through one or more related genes, and ends at a stop signal. Now it appears that animal genes may issue their directives in a substantially different way.

During a week-long meeting at the Cold Spring Harbor Laboratory in New York early last month, several different laboratories presented independent evidence that messenger RNA of a virus infecting human cells must be synthesized by a novel mechanism. (Investigators expect the genes of a simple animal virus to operate similarly to those of animal genes, since both kinds of DNA can direct protein synthesis in the same type of cells.)

The unexpected result of studies using a variety of techniques is that the messenger RNA copied from at least five different adenovirus-2 genes all begin with the same "leader" stretch of about 150 nucleotides. The pattern for that leader is located in three separate pieces on the viral DNA molecule, a distance from any of the genes (shown by the filled arrows to the right of the leader on the diagram).

All the messenger RNA molecules with the apparently identical leader sequences represent what biologists call late proteins. These proteins are synthesized only during the later phases of cell infection, at the time when DNA is also being made to pack into the new viruses. The leader sequence may play a role in regulating the expression of late protein genes, the researchers propose.

Evidence for the spliced messenger RNA includes direct analysis of the molecules. All the major species of late messenger RNAs appear to begin with an identical (or very similar) 11-nucleotide segment. These are the results of Richard E. Gelinas and Richard J. Roberts at Cold Spring Harbor. The other techniques involve binding of messenger RNAs to partially separated strands of the DNA sequences that produced them. For example, when the messenger RNA for a late protein lines up with its DNA template, unmatched DNA regions loop out, as shown in the diagram (which describes a result of Phillip A. Sharp and co-workers at the Massachusetts Institute of Technology). Several groups of researchers at Cold Spring Harbor including Louise T. Chow and Daniel Klessig also observed late messenger RNAs binding to the three leader segments as well as to individual genes.

The composite messenger RNA molecules, each with a three-segmented leader and copy of one gene, might be produced by several mechanisms. Four possible means were discussed at the symposium, Joe Sambrook, a Cold Spring Harbor researcher, reports in the July 14 NATURE. The enzyme that links together the nucleotides of new messenger RNA might jump from one section of DNA to another, or the DNA itself might rearrange to correctly position segments for a particular message. It is also possible that each DNA segment is independently copied and the resulting RNA pieces are joined. Finally a long messenger RNA containing all the leader and gene segments may be made, but later trimmed to produce any of the messenger RNA molecules that have been identified outside the cell nucleus.

Sharp and most others strongly favor the last explanation, which is consistent with the work of James E. Darnell at Rockefeller University. In the nucleus of infected cells during the late stages of infection, Darnell and co-workers observed lengthy RNA molecules that are more than 20,000 nucleotides long. (The entire adenovirus DNA molecule is only 35,000 nucleotides long.)

The important question now is whether this phenomenon of mosaic messenger RNAs is widespread. Darnell reported at the symposium that the adenovirus messenger RNAs produced continuously during an infection (somewhat illogically called early messenger RNA), seem to be controlled in the bacterial gene fashion. The start signal for copying lies at the beginning of each group of genes. However, Heiner Westphal of NIH presented evidence that messenger RNA for one of the early proteins is also spliced and might be derived from a larger precursor that loses sequences during processing. Yosef Aloni and George Khoury, working at NIH, report some messenger RNA from another animal virus, SV40, is composed of a leader sequence joined to a copy of a nonadjacent gene. "Perhaps it is not too optimistic to hope that what has been so clearly shown for adenovirus 2 may also help to explain how host cells regulate their own genes," Sambrook says. □

How to mimic an eel: Look mean

In one of the few instances of defensive, intimidating mimicry documented among fish, the Indo-Pacific plesiopid fish, *Calloplesiops altivelis,* adopts a posture and appearance that mimics the head of a noxious moray eel. In field photographs taken at Grande Comore Island, Indian Ocean, the fish (top) swims in its normal posture. When threatened (center), *Calloplesiops* transforms its entire 15-centimeter body into a copy of the 15-centimeter-long head of the moray eel (bottom). Unlike the strategy of other reef fish prey species, which hide when threatened, the *Calloplesiop*'s mimicry is designed to convey intimidation, John E. McCosker of the California Academy of Sciences' Steinhart Aquarium reports in the July 22 SCIENCE. "Rather than flee into the refuge of the reef when it encounters a predator, *Calloplesiops* simulates the abundant and aggressive moray, frightening away a predator and thereby reducing the time spent ... in less productive activities," McCosker says. *Calloplesiops,* an uncommon species, is known from the Phillipines eastward to Mozambique in coral-reefs. □

Dave Powell, Steinhart Aquarium

Microsurgery for pituitary tumors

Tumors of the pituitary gland, the master hormone gland of the brain, represent 10 percent of all brain tumors. Although such tumors may be only one-eighth of an inch in diameter, their interference with hormone production can drastically upset the body. For instance, a pituitary tumor can lead to Cushing's disease, in which a patient experiences growth failure and general obesity due to overproduction of the hormone ACTH (adrenocorticotropic hormone). A tumor can trigger vision defects or loss by pressing against the optic nerve that runs across the top of the gland. Or it can provoke a loss in sex drive or in the menstrual cycle or lead to an abnormal production of breast milk.

Until recently, treatment for pituitary tumors—radiation or hormone therapy with occasional surgery—was only variably successful. Also, surgery on the pituitary was a hazardous operation, because access was usually through the forehead, lifting aside the frontal lobes of the brain. Now a far more successful and safe technique is looming large—microsurgery.

Charles Wilson, chairman of neurosurgery at the University of California at San Francisco, has performed microsurgery on more than 300 pituitary tumor patients during the past five years. All operations have been successful, and details of the results are in press with NEUROSURGERY. Wilson's experiences with 16 Cushing's disease patients were also described at the annual meeting of the Endocrine Society in Chicago.

The microsurgical technique is a delicate surgical procedure conducted under an operating microscope with high magnification and strong illumination. The neurosurgeon makes an incision in the patient's gum, beneath the upper lip. He sweeps the facial tissues up, removes some of the cartilage at the base of the nose and enters the sphenoid sinuses, behind the nose. (There are also sinuses above and beside the nose.) The surgeon then proceeds to cut a tiny hole through the bony wall at the back of the sphenoid cavity. The wall is thin at this point; the pituitary lies on the other side of the wall, inside the brain. The surgeon proceeds to make small incisions in the gland and to remove all visible tumor. Any remaining tumor cells are cauterized (seared) with alcohol, a method that has proven valuable in preventing regrowth.

The entire procedure can be completed in about two hours. Patients are up and about in a day or two and are back to normal activities within several months. The only mark left from surgery is a thin scar across the gum above the front teeth.

The idea of gaining access to the pituitary gland through the sphenoid sinuses is not new, going back to the early 1900s. But the concept has not become practical until the advent of microsurgery under high-magnification microscopes with strong lighting. □