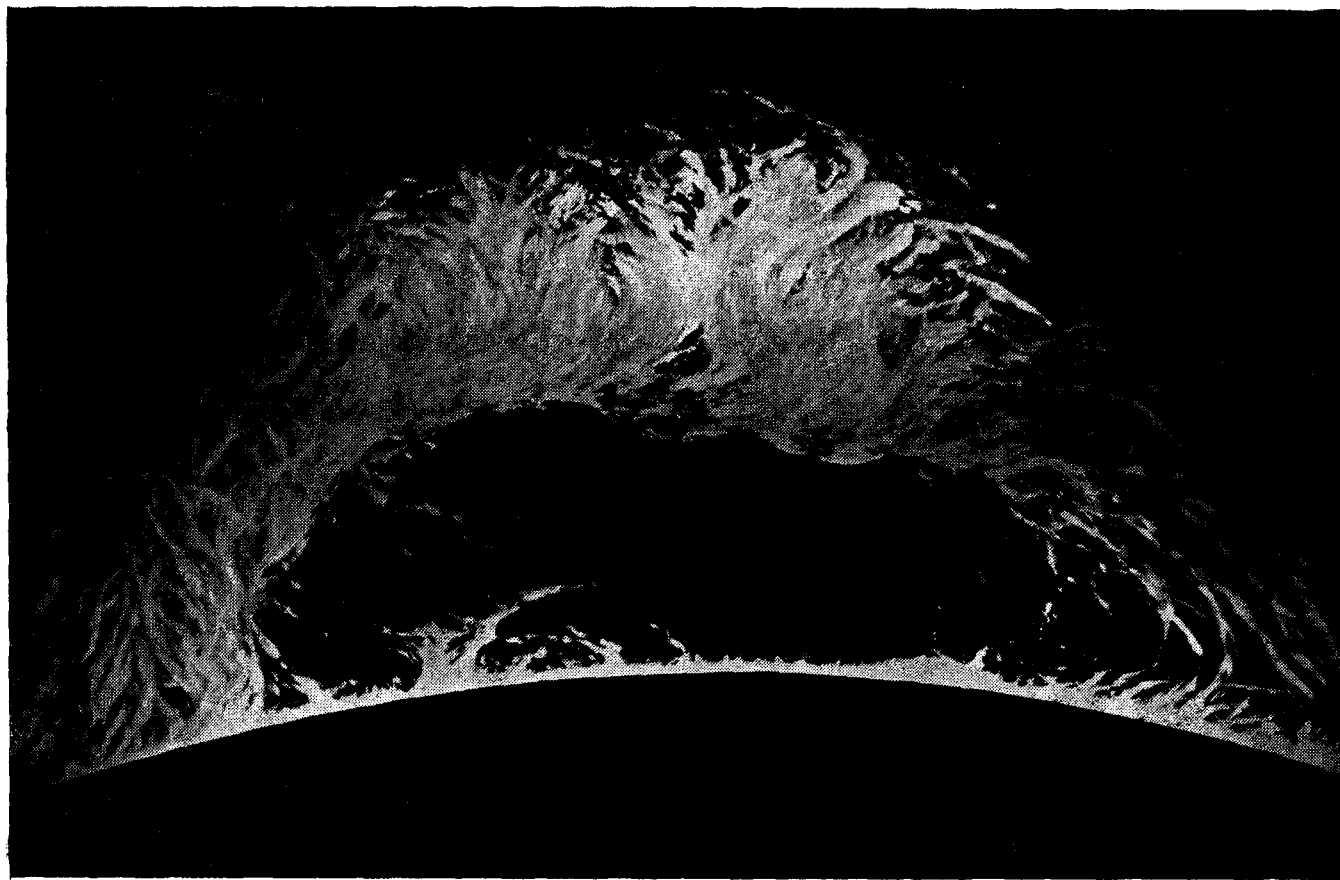




—From a mural at the Hayden Planetarium

Bridges of flame, like this one, spanning thousands of miles, draw man's awed eyes toward the sun during the IGY.

INSIDE THE SPACE-MAN

The Urge to Explore Is As Basic As Hunger Or Sex

By DR. ROBERT W. WHITE

DURING the International Geophysical Year which began last Monday—July 1, 1957—man expects to hang in the sky a moon of his own making. By way of practise, he has already lighted his first star. He has routed telephone calls along the trails of falling meteors. Before the IGY ends at midnight of December 31, 1958, he intends to try to brighten and perhaps alter the colors of the dancing aurora.

To the physical scientists of the sixty-one nations who have pooled their resources for the IGY, such manipulation of the environment does not require justification. Experience has proved to them that sooner or later experiments of this kind will bring new comforts and conveniences to the human animal. There are non-scientists among the animals, however, who feel most uncomfortable about the business. They do not understand, and are inclined to mistrust, what seems

to them to be blind, brash tinkering with the ancient mysteries of heaven. Why, they ask, should we not spend the time, the money and the energy we are spending on the IGY to exorcise earthbound devils of human society familiar to us all? How does this groping into space affect us as individuals? What does it mean to the world we live in from day to day? Does it really touch us at all? What are the motives behind the craving of apparently intelligent men for way stations in space, bucketfuls of upper atmosphere, souvenir cosmic rays and rockets to the moon?

I would like to suggest that the IGY is "over the heads" of some of us only because our understanding of ourselves is still so very imperfect. There is reason to believe that the urge to explore, and to manage what we explore, is a human urge as fundamental as the urge to procreate. I am going to propose that the IGY is an unprecedented demonstration of a yearning for competence that all normal hu-

mans are born with, and that the very existence of an IGY can be enormously encouraging to future society.

If my thesis is correct, the farther man's curiosity carries him through the unknown abysses which divide earth from the sun and planets, the more ingenious his measurement of the sun's effect on the whirling globe of gas which is our earthly outdoors, the greater will be his capability to plumb the depths of his own being. To stand apart from himself, to take himself as an object of scrutiny, he requires a sophistication and humility that he is only now beginning to acquire. The very sun on which the IGY studies now center was, less than 500 years ago, accepted as a mere satellite of man's earthly habitation, a convenience placed for his personal comfort. Man has spent much of the time since then in learning how to accommodate his emotions to his intellectual understanding of the sun's true role in his life. The learning process will accelerate as he realizes his vast vul-

nerability to environment and his consequent dependence on his fellow-men for survival.

Psychologists have long been greatly interested in human motives, but they have generally overlooked the kind of motives that propel a scientist along his pathway of discovery. Ever since Darwin made his case for man's animal ancestry, scientists have been moved to demonstrate the resemblances between human and animal behavior. For a while it seemed appropriate to speak of human instincts, pointing out the parallels between man's motives and the instinctive behavior of animals, birds, and insects. Soon it became evident that this solved few problems; nothing was gained by attributing human curiosity to an "instinct of curiosity" until a lot more was known about the real nature of instincts.

EMPHASIS then shifted to the study of "drives," such as hunger, thirst, and sex. This was more useful because one could identify the bodily organs and conditions which upset an animal's equilibrium and induced the restless search for something to restore that equilibrium. Hunger, with its depleted tissues, contractions of the stomach, and search for food became the pattern for human motives in general.

In the meantime Freud was accomplishing his momentous revelations concerning motives of which we are not aware. Listening through long hours to the dreams, fantasies, fleeting thoughts and free associations of his patients, he disclosed the ceaseless subtle operation of disguised sexual and hostile wishes. To Freud it seemed possible that all human motives reduced themselves in the end to either erotic or aggressive drives.

This kind of reasoning about motives has proved its worth for certain purposes, but it is not sufficient to explain those aspects of human behavior which are not like the instincts or drives of animals. To this end it has been necessary to develop a psychology of the ego or self. This concerns the integrating side of personality: the guiding, planning, unifying, interpreting activities which give our lives their overall direction and make us responsive to our environment. Freud and his followers have dealt grudgingly with the ego, showing reluctance to assign it any real force. Other workers have had difficulty with what I might call "powering" the ego so as to account for its controlling effect on drives. Some vital biological root has been overlooked—the very root we need if we are to understand the activities of man-the-scientist.

Perhaps if we look closely at the behavior of very young children we can discover what it is that lies behind the adult desire to understand and influence the environment. To this end I invite you to visit the nursery in the house of Jean Piaget in Geneva.

My selections will be drawn from Piaget's studies of the growth of intelligence from its earliest manifestations in his own child, Laurent.

At three months, before vision and prehension are fully coordinated, Laurent, lying in his bassinet, learns fortuitously that if he pulls a string he will shake a rattle suspended from it. His behavior thereafter transcends grasping for the sake of grasping or looking for the sake of looking. The child's "movements are centered on a result produced in the external environment, and the sole aim of the action is to maintain this result." Let us now observe him a little later when he has reached the ripe age of no years, three months and ten days.

"I place the string, which is attached to the rattle, in his right hand, merely unrolling it a little so that he may grasp it better. For a moment nothing happens. But at the first shake due to chance movement of his hand, the reaction is immediate: Laurent starts when looking at the rattle and then violently strikes his right hand alone, as if he felt the resistance and the effect. The operation lasts fully a quarter of an

hour, during which Laurent emits peals of laughter."

Three days later the following behavior is observed.

"Laurent, by chance, strikes the string while sucking his fingers. He grasps it and slowly displaces it while looking at the rattles. He then begins to swing it very gently, which produces a slight movement of the hanging rattles and an as yet faint sound inside them. Laurent then definitely increases by degrees his own movements. He shakes the string more and more vigorously and laughs uproariously at the result obtained."

Notice that the behavior is directed and persistent. It is also selective: The infant does not try to conserve all impressions, but only those which are experienced as produced by his own activity. The act yields pleasure and gratification as evinced in the child's smiles and laughter. Learning is exhibited in the form of improved coordination on successive occasions. This is, in short, a form of motivated behavior, in which the gratification appears to be intrinsic and not derived from nutritive or erotic needs. Notice further that these simple examples of infant behavior involve the prolonging and enjoying of sensory experience, manipulation, exploration, activity and mastery, all at one time. From eight to twelve months, be-

IF WE IMAGINE EARTH'S ATMOSPHERE as a great unknown ocean, we can recognize the experiments of the International Geophysical Year as cosmic counterparts of the Atlantic voyages of Christopher Columbus. Astronomers of Columbus's day knew very well, from mathematical calculations, that the earth was round. But they didn't know what lay beyond their immediate horizon. Today's geophysicists are in much the same position regarding the horizon of space. It takes an historian, then, to fully appreciate the implications of the next eighteen months in the life of science and of the common man.

Dr. Robert W. White, Chairman of the Department of Social Relations at Harvard University, is an historian who was moved to study psychology. With bachelor's and master's degrees in social and intellectual history already behind him, he left an instructorship at the University of Maine and turned from the public sweep of government and social force to scrutinize the private fate of individual men. He received his Ph.D. from Harvard in 1937 and has remained there since then, advancing from instructor, research associate, lecturer, and director of the Psychological Clinic to his present post as department chief. His desire to relate the abnormal to the normal processes of personality development has led him to progressively intensive case studies in abnormality, normality, and, more recently, "the relatively normal." Now fifty-three years old, with a wife (nee Margaret L. Bazeley) and two sons (David, fourteen, and Timothy, eleven), Dr. White has what a layman might describe as a "relatively normal" relationship to the IGY. A qualified explorer, quite alive to the mysteries of outer space, he confines his realm of discovery to the inner spaces of human personality.



Dr. Robert W. White

havior can be observed in which the child explores the properties of objects and tries out his repertory of actions upon them. This soon leads to active experimentation in which the child attempts to provoke new results.

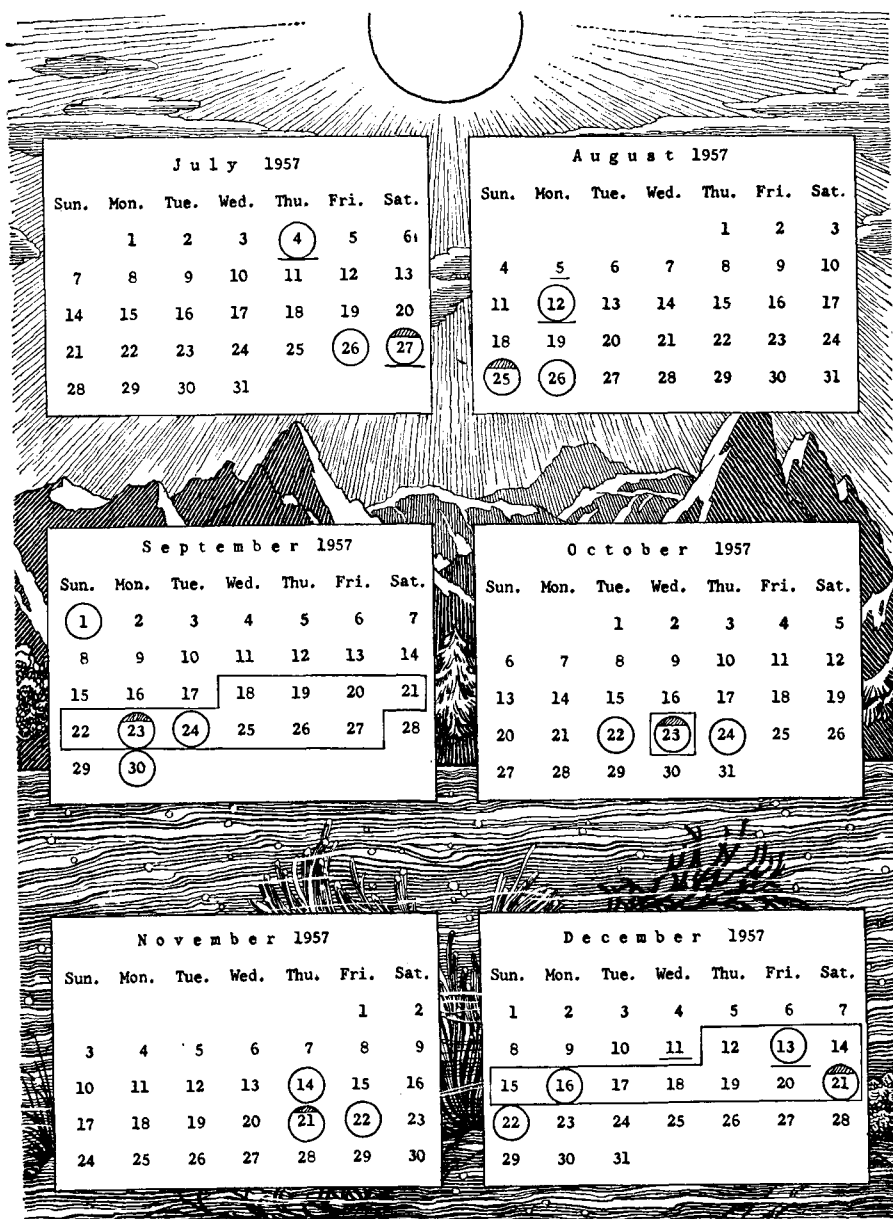
"He grasps in succession a celluloid swan, a box, and several other small objects, in each case stretching out his arm and letting them fall. Sometimes he stretches out his arm vertically, sometimes he holds it obliquely in front of or behind his eyes. When the object falls in a new position (for example on his pillow) he lets it fall two or three times more on the same place, as though to study the spatial relation: then he modifies the situation."

If these examples emphasize exploration and curiosity, they involve mastery as well, and this is more sharply apparent in other examples involving getting objects with a stick, pulling objects between bars, putting things into boxes, and other acts requiring increasing physical and mental dexterity and skill.

What is the child doing in these examples, and why is he doing it? If we look for the common aim of all his actions, it is clear that the infant is building up his practical knowledge of the environment, of his own potentialities for action, and of the effects his actions can have upon the environment. By behavior of this kind, the young organism enters into a circular interaction with the environment, enters into commerce with it, and discovers how different parts of it can be maintained and altered. It is obviously impossible to attribute this behavior to anxiety, which would produce avoidance rather than commerce with the stimulating field. It is difficult to relate the behavior to drives like hunger and sex, which at this stage of the game are not being in the least satisfied by the infant's explorations. It seems to me that we must admit an independent motive which prompts the infant to find out what can be done with the environment. Satisfaction comes directly from assimilating impressions and producing actions so that the environment is influenced. Of course the child is merely playing, but this does not diminish the importance of his behavior. He is dealing with the world.

As I indicated at the beginning of these remarks, the word I have tentatively chosen to describe this realm of behavior is *competence*. To be competent means to be sufficient or adequate. As one dictionary puts it, "one is competent who has all the natural powers, physical or mental, to meet the demands of a situation or

IGY Calendar for 1957



Scientists of sixty-one nations will time simultaneous observations of natural phenomena at far scattered points of the earth according to a fixed calendar during eighteen IGY months ending December 31, 1958. The first six months of this cosmic almanac appear in sketch above. Ten-day periods boxed within the fine ink line in September and December are World Meteorological Intervals. During these times weathermen around the globe will send up radiosonde balloons four times a day instead of the usual two times, and on each occasion will make a special effort to reach the highest possible altitude. Dates marked with a simple circle are Regular World Days, on which rocket flights and balloon ascensions will be concentrated everywhere. Dates marked with a dark-capped circle are Regular World Days at New Moon, when attention will be fixed especially on the aurora. Dates that are merely underlined will be good days to observe meteors. Dates that are underlined and circled will be good to observe meteors, too, but they are also World Days and as such established times for rocket firings and balloon launchings. Dates that are both circled and squared are days of total eclipses of the sun.

work." The evolutionary importance of such a tendency, particularly in an organism with a plastic nervous system capable of much learning, can hardly be exaggerated. If all learning about the environment had to be done under stressful conditions such as hunger or danger, it would be hard to be prepared for changing circumstances. If, on the other hand, knowl-

edge of the environment can be built up between occasions of stress, when the organism is relatively calm and most capable of broad learning, there will soon be a backlog of useful familiarity which will be available when emergency strikes.

But competence does not imply simply preparing the instruments for danger. Commerce with the environ-