Babies—*Continued*

would go promptly after the spoon, and what is more, almost 50 per cent. of babies at even six months pass this test of mental development.

Evidence that environment counts for more than heredity is hopeful evidence, Dr. Furfey believes. Heredity is largely a matter of chance in this world, and attempts to improve racial stocks necessarily make slow progress. But a child's environment may be improved immediately and directly through the education of its parents and through general education of the public.

It is only about one generation ago that parents began to be introduced to brand-new ideas about spinach, tomato juice, cod liver oil, sunlight and other vital aids to a baby's physical well-being. The facts about a baby's mental and emotional development are being discovered more slowly and with more uncertainty. But Dr. Furfey believes that when the scientific investigations can be organized for public use and put into understandable terms, mothers are ready to apply new knowledge on the mental well-being of babies.

What happens when families and homes allow young personalities to get askew is shown in the work of one of Dr. Furfey's student psychologists in an experiment at the Washington Child Research Center. This young psychologist, Miss R. F. O'Grady, is investigating the fantasy conversations that some children carry on half aloud as they fall asleep. By use of a telephonic apparatus, the psychologist listens in on the children's half-dreamy, rambling remarks and records them in a note book. Children who have this habit of talking themselves to sleep are generally problem children, whose everyday lives are not satisfactory and happy. The child compensates for an inadequate day by picturing himself as the center of an attractive situation.

One little girl studied by Miss O'Grady spends several hours at night before she drops off to sleep going over a story in which she is sick or injured and is the center of an anxious group of doctors, nurses, relatives and friends.

"A bad cut clear up to my ear," the little four-year-old murmurs. "I can't move; the bandages are so tight. The doctor is sewing it up a little bit. The doctor is smelly." And so on, with much detail of courage on her part and admiration and excitement all around her. (*Turn to next page*)

Einstein Extends Theory to Electricity

Physics

The new theory of Albert Einstein, which will soon be published by the Prussian Academy of Sciences, is said to be as exclusively mathematical as was his original theory of relativity and therefore will be comprehensible only to leading experts. But from what little has been given out in Berlin, the nature of the paper may be inferred.

According to the relativity theory the gravitational effect of a body exercised by its mass is confined to the gravitational field which surrounds it and within which space the body is consecutively affected. Space, consequently, is no absolute independent entity, but exists only in relation to the influencing body. The motion of bodies is not determined by any general force of gravitation drawing them together, but by the properties of gravitational fields, from which their motions can be determined.

Similarly every electrically charged body is surrounded by an electrical field, the charges and properties of which determine the electrodynamics of the body. These could be derived from the known characteristics of the electrical field.

The older theories used to derive the laws of electrodynamics from hypothetical motions of the smallest particles of mass, thus regarding electrodynamics as a special part of mechanics. Modern physics tried to solve the difficulty by the reverse process; that is, by reducing mechanical changes to electrodynamical causes, regarding the motions of material masses as electrical processes. From this point of view mechanics became a special part of electrodynamics in general.

By the application of the mathematical laws of the gravitational field as developed by the relativity theory, Einstein is said to have settled the above question by applying them to the electrodynamic field, thus uniting both fields under identical laws.

According to this advance information, Einstein (*Turn to next page*)

Minute Current Reveals Stars' Heat

Astronomy

How an infinitesimal electric current, which would have to be amplified twenty billion times to make it a single ampere, is used to study the temperatures of the stars and planets was described recently by Dr. Seth B. Nicholson at the Carnegie Institution of Washington. Dr. Nicholson is an astronomer at the Institution's Mt. Wilson Observatory.

"The greatest success in measuring the heat received from the stars has been obtained with the thermocouple," he said. "A thermocouple consists of a junction of two elements which, when heated, generates an electric current, that can be measured with a galvanometer. The weight of a complete thermocouple with receivers one-half millimeter in diameter, including the connecting wires, is about one-thousandth that of a drop of water.

"A star, of the same color as the sun, which is just bright enough to be easily seen without a telescope, radiates on the whole United States about the same amount of heat as is radiated by the sun on one square yard. When the heat from such a star which falls on the 100-inch mirror of the Hooker telescope at Mount Milson, the area of which is six square yards, is focused on the receiver of a thermocouple, the temperature of the receiver is increased about one-half-millionth of a degree Fahrenheit, and a current of electricity is made to flow through the galvanometer. The current thus generated is about one-twenty-billionth of an ampere. The currents produced in this way are proportional to the amount of heat received by the thermocouple, so that the deflection of the galvanometer when a star is focused on the thermocouple is a measure of the heat received from that star.

"The heat from many stars has been measured in this way, and of those measured more heat reaches the thermocouple from the red star Betelgeuse, in the constellation of Orion, than from any other. Much of the heat from stars and from the sun is absorbed by the earth's atmosphere. This absorption is especially large in the blue and violet light and when allowance is made for this loss we find that more heat reaches the earth from the blue star Sirius than from any other star."

Though the planets shine with reflected sunlight and are far cooler than the stars, the thermocouple can be used to measure (*Turn to Page 52*)

The Value of "Cranks"

Invention—Psychiatry

RUPERT T. GOULD in *Oddities: A Book of Unexplained Facts* (Stokes):

Of the many millions of fools who cumber the earth, I suppose that the fanatics, taking them all around, are the greatest nuisance—and, tested by old-fashioned notions of personal independence and "the liberty of the subject," the one most actively mischievous. Possessing, far too often, that misleading form of energy which it is fatally easy to mistake for capacity; restrained by no false modesty from minding everybody else's business; and simultaneously unbalanced and supported by a chronic inability to conceive that there can be two sides to any question, they are the bacteria of the civilized world—a fertile source of past, present and future disorders.

But if the fanatic, generally speaking, is an unpleasant figure, the harmless "crank" can be very amusing—provided that you merely chuckle over his lucubrations and sternly refuse to be drawn into correspondence with him. The latter caution is a *sine qua non*. He can never be converted from his mistaken notions, for the serene ignorance which gave them birth, forms also a mental armor proof against the clearest demonstration. In addition, he is generally of irritable temperament; he has much spare time; he is blind to the decencies of ordinary controversy, and he wields a vitriolic, if halting, pen.

Such is the flat-earther, the circle-squarer, the Ten Tribes man, the Jacobite, and the man who, measuring the Pyramids with a foot-rule (or, more commonly, relying on similarly accurate measurements made by other people) establishes to his own satisfaction that the early Egyptians were only a little lower than the angels and, possessed of an amazing and unsuspected amount of scientific and other knowledge, took the eminently reasonable step of declining to commit any of it to writing, leaving it to be deduced from the dimensions and orientation of various royal tombs (used in the monarch's lifetime as observatories).

Among this happy band (one can hardly add "of brothers," for in general one crank hates another most whole-heartedly) an honored place will, I think, always be found for the man who is convinced that he has discovered the secret of "perpetual motion" (which, I ought perhaps to explain, happens to form the subject of this essay). That place is his of right, because, like the king, he never dies. He is always with us—and there are always a good many of him.

The reason is not far to seek. The necessary qualifications for a perpetual-motion seeker are few and simple. He must have a little mechanical skill—enough, say, for simple jobs about the house. He must have a little spare time and a certain amount of perseverance and self-confidence. And he must be ignorant, or all but ignorant, of two subjects in particular: the fundamental principles of mechanics and the works of his predecessors.

Of men of this type (the subject does not seem to have ever had much attraction for the other sex) there is always an ample supply—one might almost say a superfluity. And it is a curious feature of their unhappy obsession that it takes a variety of forms and directs their attention to several different objects.

Some, for example, consider that what is required is a clock that will never need to be wound; that such a clock will, in particular, be of the utmost value for finding longitude at sea; and that there is an enormous government reward on offer to its successful inventor. All three of these notions are baseless.

In the first place, many clocks have been made which do not require winding; their construction presents no great mechanical difficulty, and they can be fitted with any of several well-known systems of self-winding. They are mechancial freaks, and generally poor timekeepers. Secondly, to find longitude we merely need a timepiece which keeps accurate time—it does not in the least matter how often it has or has not been wound, except that in general the more often it is wound the better time it keeps. Thirdly, there is no government reward on offer for such a timepiece—or for any other form of "perpetual motion" machine.

Others of the fraternity propose to obtain "perpetual motion" by means of mills worked by tidal water or by fans placed in tall chimneys and exposed to a continual upward draught, or by various other applications of natural sources of power. Like the first class, such "perpetual motions" are, if not common, at least far from unknown.

But the inventor who is at the same time nearest of all his tribe to the real idea of "perpetual motion" and farthest of all from realizing it in practice, is the man who attempts to make a machine which will give out more work than is put into it; one which actually creates energy and does not depend on external supplies of that useful commodity. Apart from occasional dabblings in hydrostatics and pneumatics, he generally looks to some application of gravity or magnetism for the mainspring of his machine, and he goes his way serenely unconscious of the fact that he is really doing his best to produce a working model of a contradiction in terms. He might not less usefully devote his time to drawing four-sided triangles.

Science News-Letter, January 26, 1929

Star's Heat—*Continued*

their temperature, he said, in telling of results.

"Mercury is certainly very hot and has little if any atmosphere. The maximum temperature is about 1300 degrees Fahrenheit. The distribution of radiation over its surface is much like that of the moon. Venus is covered with clouds and the radiation measured is from the high cloud surfaces and tells very little except by inference about the actual surface temperatures. The night temperature on Venus is much higher than that on Mercury or the moon, being about 9 degrees below zero Fahrenheit. The temperature on Mars varies greatly with the season and the time of day, but the temperatures there are somewhat like those on the earth, at least like those at very high elevations where the atmosphere is rare. The outer planets are very cold, as might be suspected from their great distances from the sun, unless they give off heat from their interiors. Not many years ago it was commonly supposed that Jupiter was warm, probably warm enough to give out some light of its own. The thermocouple measures show that this is not the case, and that the temperature of Jupiter is about 216 degrees below zero Fahrenheit."

Science News-Letter, January 26, 1929

The River Nile got its name from the Sanskrit word "nila" meaning "blue".