[SCIENCE.]

COMPOSITE PORTRAITS OF MEMBERS OF THE NATIONAL ACADEMY OF SCIENCES.

Those of the members who were present at the Washington meeting of the Academy last spring will remember that, at the request of Professor Brewer and myself, they sat for their separate photographed portraits for the purpose of obtaining an experimental composite picture. Professor Baird kindly offered the facilities of the photographic department; and the pictures taken by Mr. Smilie, the photographer in charge, bear the same stamp of excellence that characterizes so generally the work of that department of the National Museum.

As only one or two previous attempts, I believe, have been made to produce composites in this country, I will state briefly what they are, and how they are made. The idea in its broadest sense was conceived and applied by Francis Galton, for the purpose of obtaining an average or type portrait, *i. e.*, a picture that should show the features that are common to a group of individuals, and exclude those that are purely individual. It is clear that in proportion as this result is attainable, the method will be of value in obtaining a clear conception of the external characteristics of any given type or class.

Galton reminds us that, during the first days of a traveler's meeting with a very different race, he finds it impossible to distinguish one from another, without making a special effort to do so; to him the whole race looks alike, excepting distinctions of age and sex. The reason of this is that, by short contacts with many individuals, he receives upon his retina, and has recorded upon his memory, a composite picture emphasizing only what is common to the race, and omitting the individualities. This also explains the common fact that resemblances among members of a family are more patent to strangers than to the relatives.

The individuals entering into these composites were all photographed in the same position. Two points were marked on the ground glass of the camera; and the instrument was moved at each sitting to make the eyes of the sitter exactly coincident with these points. The composites were made by my assistant, Mr. B. T. Putnam, who introduced the negatives successively into an apparatus carefully constructed by himself, and essentially like that designed by Mr. Galton, where they were photographed by transmitted light. The arrangements of the conditions of light, etc , were such that an aggregate exposure of sixty-two seconds would be sufficient to take a good picture.

What was wanted, however, was not an impression of one portrait on the plate, but of all the thirty-one; and to do this required that the aggregate exposure of all the thirty-one should be sixty-two seconds, or only two seconds for each. Now, an exposure of two seconds is, under the adopted conditions, too short to produce a perceptible effect. It results from this, that only those features or lines that are common to all are perfectly given, and that what is common to a small number is only faintly given, while individualities are imperceptible. The greater the physical resemblances among the individuals, the better will be the composites. A composite of a family or of near relatives, where there is an underlying sameness of features, gives a very sharp and individual-looking picture.

It would be difficult to find thirty-one intelligent men more diverse among themselves as regards facial likeness than the academicians entering into this composite. They are a group selected as a type of the higher American intelligence in the field of abstract science, all but one or two being of American birth, and nearly all being of American ancestry for several generations. The faces give to me an idea of perfect equilibrium, of marked intelligence, and, what must be inseparable from the latter in a scientific investigator, of imaginativeness. The expression of absolute repose is doubtless due to the complete neutrality of the portraits.

Fig. 3 contains eighteen naturalists and thirteen mathematicians, whose average age is about 52 years.

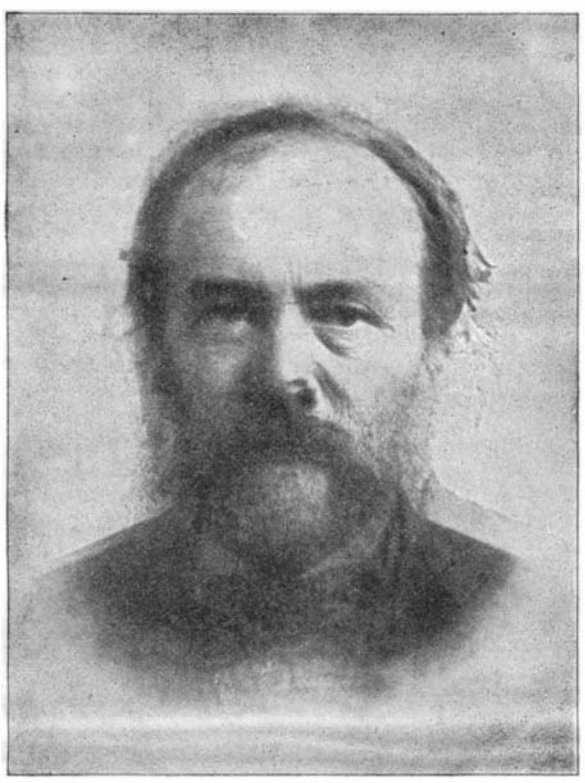


FIG. 1.—TWELVE MATHEMATICIANS.

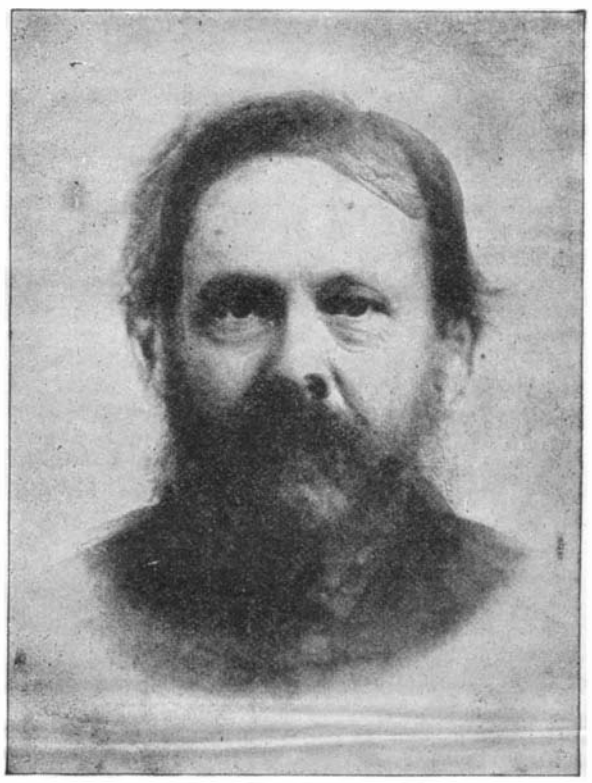


FIG. 2.—SIXTEEN NATURALISTS.

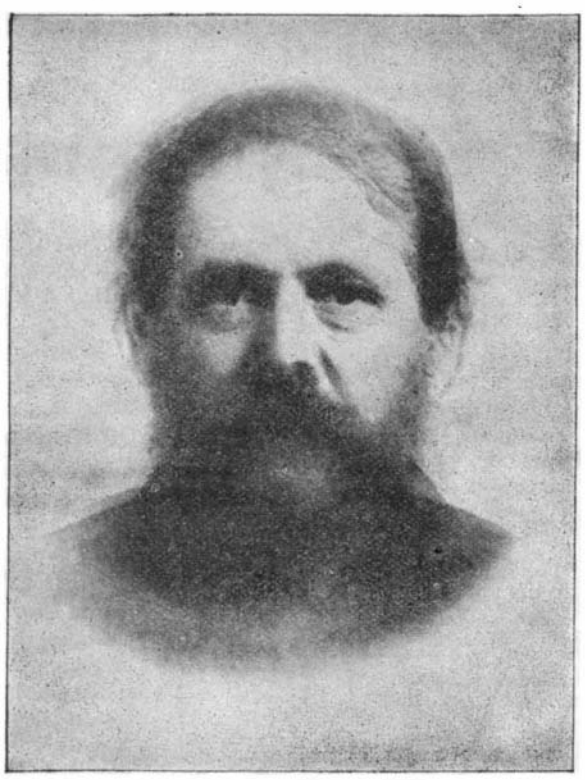


FIG. 3.—THIRTY-ONE ACADEMICIANS.

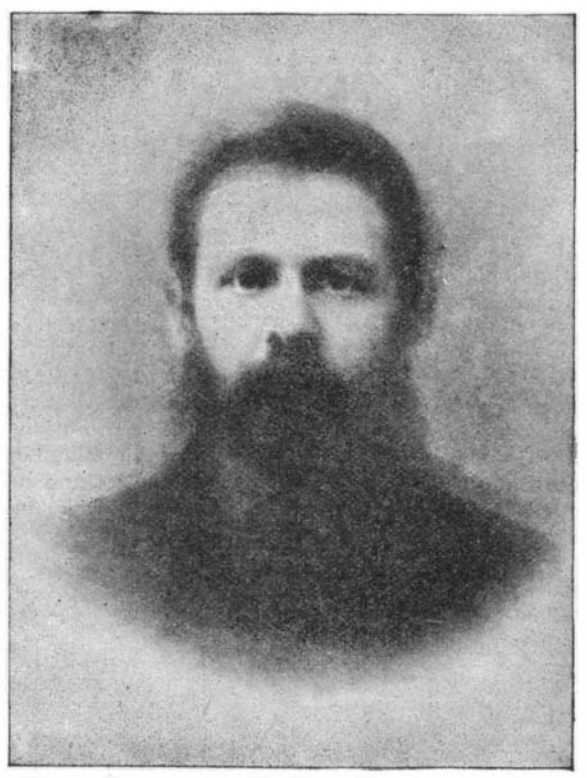


FIG. 4.—TWENTY-SIX FIELD-GEOLOGISTS, TOPOGRAPHERS, ETC.

COMPOSITE PORTRAITS OF AMERICAN SCIENTIFIC MEN.

Fig. 1 contains twelve mathematicians, including both astronomers and physicists, whose average age is about 51⅔ years. Fig. 2 is a composite of sixteen naturalists, including seven biologists, three chemists, and six geologists, with an average age of about 52½ years.

I may mention, as perhaps only a remarkable coincidence, that the positives of the mathematicians, and also of the thirty-one academicians, suggested to me at once forcibly the face of a member of the Academy who belongs to a family of mathematicians, but who happened not to be among the sitters for the composite. In the prints this resemblance is less strong, but in these it was observed quite independently by many members of the Academy. So, also, in the positive of the naturalists, the face suggested, also quite independently to myself and many others, was that of a very eminent naturalist, deceased several years before the sitting for this composite.

There is given also a composite (Fig. 4) of a differently selected group. It is of twenty-six members of the corps of the northern transcontinental survey—an organization of which I had charge, and the object of which was an economic survey of the Northwestern Territories. It was a corps of men carefully selected as thoroughly trained in their respective departments of applied geology, topography, and chemistry, and having the physique and energy, as well as intelligence, needed to execute such a task in face of many obstacles. The average age of this group was 30 years.

RAPHAEL PUMPELLY.

Luminous Rays.

M. Charpentier has contributed to the *Comptes Rendus* some further observations relative to the distribution of luminous intensity and visual acuity in the olar spectrum. The author has studied the distribution of light in the spectrum, determining, by the aid of his photoptometer, the necessary and sufficient quantity of light which produces the sensation of light in different parts of the spectrum. It is accepted that luminous intensity, or brilliancy, is different from visual acuity; the former represents the exciting power of light upon the retina, the latter answers to the greater or ess facility with which this light permits an observer to distinguish the forms of small objects. These two manifestations of the power of light are not proportional to one another, but differ according to the refrangibility of the light. It is of interest therefore to study, by some rigorous method, the distribution of visual acuity belonging to the spectrum. The method adopted by M. Charpentier consists in ascertaining the amount of light necessary to enable an observer to distinguish a group of small points placed close together upon a black ground. The two curves which represent the distribution of brilliancy and visual intensity in the normal solar spectrum are notably different from one another.

The variations in brilliancy are less extensive than those of visual intensity. Both curves present a maximum; but the situation of this maximum is different in the two curves. The mean situation of the maximum of visual intensity is in the yellow, not very far from the D line. The maximum of brilliancy, on the contrary, is about the limit of the green and blue. This fact confirms the idea already expressed by the author, that the perception of light and of forms corresponds to two distinct physiological processes. It is remarkable that it is the latter—the perception of forms—which seems to be proportional to the absolute energy of luminous radiation. The other process—the crude perception of light—augments in intensity, not only with the absolute energy, but also with the refrangibility of the light. Luminous radiation seems therefore, according to all known facts, to act as a decomposing force, setting at liberty the potential energy accumulated in the photo-chemical substance of the retina during repose.

FIVE horses were lately killed by lightning in a singular manner at Camilla, N. Y. They stood with their necks over a wire fence, when suddenly the lightning struck the fence at a distance of 1,000 feet from the horses. The current traversed the wire. and went to ground through the horses.

Pygmies, Real and Fictitious.

In almost every country of the world, pygmies figure either in history or tradition; but tradition always has some foundation, man only weaves fiction from facts, and the best novelists are close observers of human nature. How many things long regarded as fables have been proved true? Herodotus, the father of history, who lived B.C. 484 years, was once called the father of lies, but we now know that he told only truth. Marco Polo, who in 1274 went with his father to Tartary, China, different parts of India, Persia, and Asia Minor, though an illustrious traveler and writer, was considered very untruthful, nevertheless the more we learn of those countries, the more truthful his accounts appear.

The stories of "little people," fairies, sprites, and elves, must have originated from the existence of an extremely diminutive race, a vague recollection of which has passed from generation to generation. Fables make the pygmies two feet high; the Greeks, having known of giants, as if to make a contrast pictured to themselves these pygmies, getting the idea from a certain people of Ethiopia, called Pechinies, who were very small. Swift made his Gulliver find men six inches high in the Isle of Lilliput; but Cyrano de Bergerac, in his imaginary voyage to the sun, found people not bigger than his thumb.

Among the many ludicrous stories told of pygmies, it is said that a certain King of Bavaria, at his wedding feast, was served with a pie from which a tiny dwarf, armed with lance and sword, jumped out on to the table, to the great astonishment of all the guests.

But apart from such extravagant tales, there are some proofs that very dwarfish people have lived in different places. Some years ago, on the banks of the river Merrimac, twenty miles from the Isle of St. Louis, a number of stone tombs were found arranged in symmetrical order; none of them were more than four feet long, and the human skeletons found in them only measured three feet, though the teeth showed that they were adults; the skulls were out of proportion with the rest of the body.

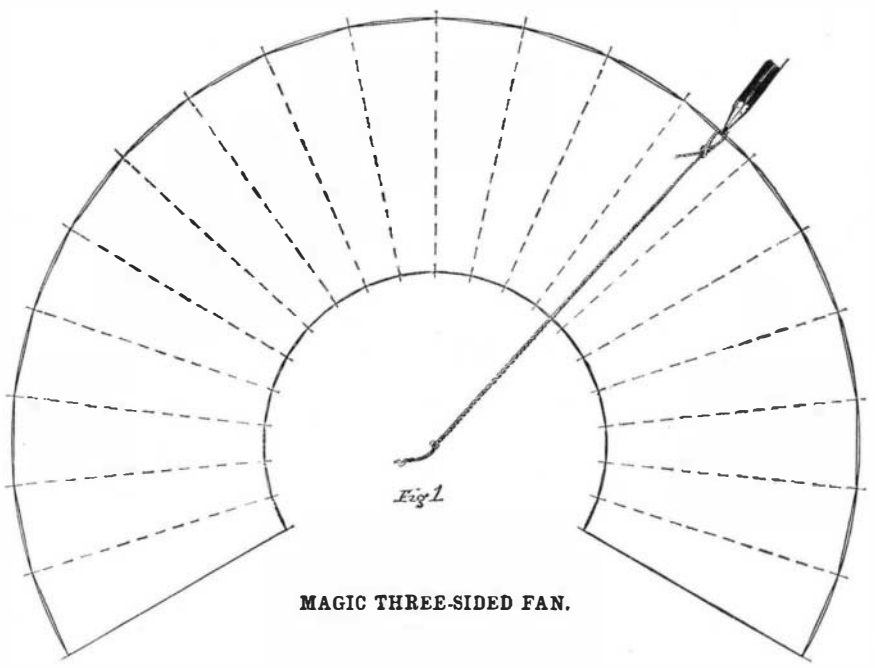
Aristotle, who was a great naturalist, said that trustworthy witnesses testified to the existence of minute men, and that they lived in caves washed by the waters of the Nile. Pliny even gives various details regarding their habits, and the geographical position of the places where they dwelt. On the banks of the upper Nile, where the Greeks placed the pygmies, modern travelers have found whole tribes of dwarfish men.

In Russia and Turkey, until quite lately, great sympathy was felt for dwarfs, they being generally considered keen witted and often talented. In Germany, in the eighteenth century, a dwarf was considered a necessary appendage to every noble family. In this present century there have been isolated cases of extremely small people, as, for instance, Richebourg, who died in Paris in 1858 at the age of ninety. He was twenty-three inches high, and during the revolutionary period he is said to have passed in and out of Paris, as an infant in the arms of a nurse, with dispatches very dangerous to carry wrapped in his baby clothes. In Mexico, especially in the State of Yucatan, and adjacent islands, there are many stories current about dwarfs; and if the natives are questioned concerning the builders of the old ruined edifices found in those parts, they invariably say, "The Puzob (pygmies) built them." In the islands of Cozumel and Mugeres there is a firmly rooted belief that "little people" wander around at night; many solemnly protest that they see them, and accuse them of disturbing their slumbers by hammering on benches and shaking their hammocks.

On the east coast of Yucatan there are various places, such as Nisuete and Meco, that any traveler may visit, though he must go armed, and keep a sharp lookout for Indians, who may fall upon him at any minute. There can be seen vestiges of small cities, all the houses made of stone, but not large enough for people more than two or three and a half feet high to occupy with any comfort.

In Cozumel Island we saw well constructed triumphal arches but nine feet high, and in the same place there are sanctuaries, temples of worship, built of carefully hewn stones; the doorway of the largest was three feet high, one foot six inches wide, the entire building measuring, outside, but nine feet in height, fourteen in length, and twelve in depth; we have in our possession plans of these buildings. The Indian who accompanied us to them affirmed that he always saw the "little people" at night, but they never spoke to him. He said: "They are very small, and wear big hats. Once, at the entrance of a cave in the forest, I found a clay figure, which was an enchanted dwarf, and it was reading a book; I picked it up to carry it home, but then I felt afraid and put it down again. Next day I returned to look for it, because I wanted to have the *puz* (dwarf), but I could not find the place."

ALICE D. LE PLONGEON.



MAGIC THREE-SIDED FAN.

An Indian Cemetery.

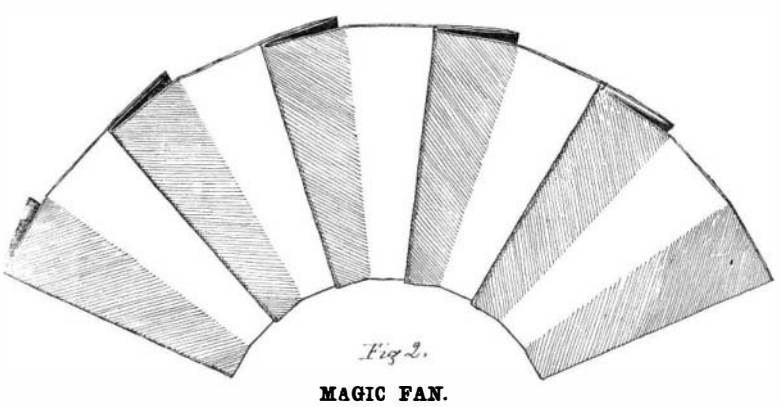
The small uninhabited island of Memaloose in the Columbia River, which is about 100 miles below Portland (Oregon), has from time immemorial been the burial place of the Indian tribes of the Wascos and Alickitats, among the famous Indian chiefs interred there being Malatowack and Powshensha. The customs observed after death among these two tribes are as follows: The bodies are swathed in fine linen bands, covered with a profusion of ornaments, and conveyed in a canoe to the island of Memaloose, where they are laid upon the ground until the rain, the wind, and the birds of prey have done their work. When nothing but the whitened bones remain, they are carefully gathered up and placed in a rough sarcophagus, where they are supposed to rest until the trumpet sounds on the last day. But the truth is that doctors, students, and collectors of fossils are continually going to this cemetery for skulls and skeletons.

A STATUE of Nicolas Leblanc is being erected in the Conservatoire des Arts et Metiers, at Paris—80 years after the great inventor perished of want. The stone given in place of bread is sometimes rather late.

HOW TO MAKE A MAGIC THREE-SIDED FAN.

A fan that is equally applicable for winter or summer is a novelty. Such a fan any of the readers can make by following the directions given below, and they will be amply rewarded for their trouble by the looks of astonishment and wonder with which their work will be greeted, if introduced as part of some parlor entertainment during the winter, or casually opened and closed while fanning themselves on the piazza of their favorite hotel at the seashore. The third side of the fan is made by pasting eight of the folds together in four pairs. When the fan is open, one side of the pasted folds is concealed. The third side is shown by opening the fan the reverse way. The three sides are made apparent, without any explanation, by putting a different picture on each side. *Material Needed.*—All the material required is a sheet of stout paper twenty-five inches by nineteen; an old fan, or a piece of straight grained hickory about twelve inches long and quarter of an inch thick *How to Make the Fan.*—Lay the sheet of paper upon the table, and mark about three-fourths of two circles on it (see Fig. 1). The inner circle should have a radius of four and one-half inches; the outer circle, a radius of eleven and a quarter inches. Use the same center for each circle. If you have no dividers to make them with, a piece of string with a loop in one end, to place the pencil in, and a pin fastened in the other (and stuck in the table), will do equally as well (Fig. 1). Divide the outer circle into twenty equal parts, each part two and three-eighths inches wide. From each of these points rule a line to the center of the circle (see dotted lines in Fig. 1).

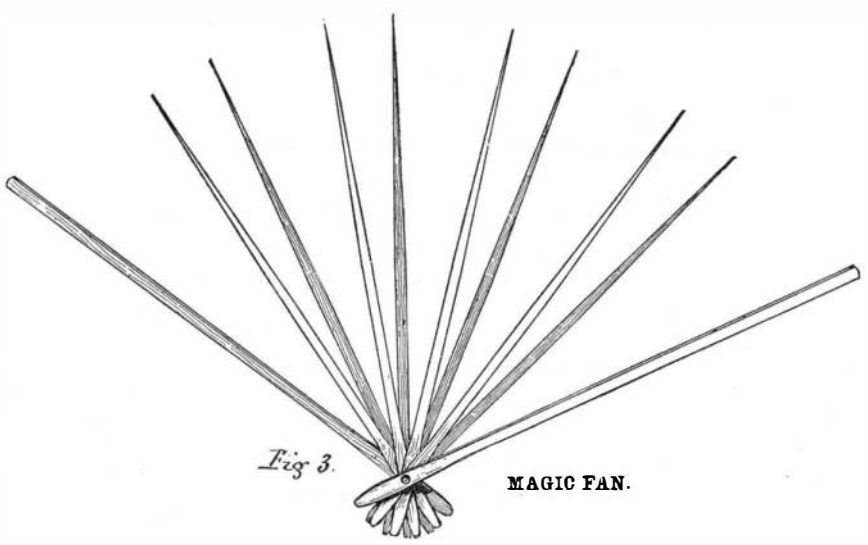
In cutting out the paper, cut straight from where the dotted lines cross the circles; do not follow the curve. The paper should be folded along the dotted lines. By running the thumb nail along each bent edge, the paper will be made to hold in place while the pasting is being done. The second diagram (Fig. 2) shows how the paper lies when ready for the sticks to be placed in.



MAGIC FAN.

There are ten sticks in the fan; they may be got from an old fan by removing the covering, or whittled from a piece of hickory. The eight center sticks should be eleven inches long, quarter of an inch wide, and about the thirty-second of an inch thick. The two outside sticks are the same width, but twice as thick, as the center ones, and one inch longer. The eight center sticks should be tapered from about the middle until they come to a point at the top end. Three-quarters of an inch from the thick end of each stick, holes will have to be made to fasten them together; this can be done with a fine drill, or burned through by a wire heated over a gas flame (Fig. 3). To fasten the sticks together, bend one end of a piece of wire (about an inch long), in the form of a loop, small as possible, then push the straight end through the holes, and bend it in the same way. If the sticks of an old fan are used, and there are more than ten, remove the surplus ones, and fasten the proper number tightly together again.

To fasten the sticks to the paper, glue or mucilage will be the best thing. Begin by pasting the top stick to the center of the last fold to the right (as the paper lies in Fig. 2). When it has dried, turn the whole thing over, and after putting mucilage between the fourth and fifth folds, place the two undermost sticks between them, at the extreme edges of the folds; press between the palms of your hands and the table until they have had time to adhere. Then paste the two next sticks between the eighth and ninth folds; in the same manner. Now fasten the next two between the twelfth and thirteenth folds, and you will have progressed as far as shown in Fig. 4. The sixteenth and seventeenth folds will use up the two remaining center sticks. Now paste the last stick to the outside of the last fold, and close up the fan, allowing it to become thoroughly dry before putting on the pictures.



MAGIC FAN.

By putting only one picture on your fan, it can be made to appear and disappear at your wish, by opening and closing the fan in different directions. Be sure and get the picture on the flap side of the fan, or it will fail to make the magical change, because the other side does not alter, whichever way the fan is opened. If scrap pictures are used, they will have to be divided (with a sharp knife) along the edge of each fold that they cross, after being put on.

If you possess any artistic ability, it can be put to