SHORT COMMUNICATIONS

# DRAGONFLIES IN *ORIGAMI* *

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16 origami projects (folding paper instructions) representing dragonflies are regis-
tered and studied. Both technical and representational aspects are described for each
folded model. A basic geometric outline of a dragonfly is defined based on these
sculptures.

## INTRODUCTION

*"Origami is an art of economy. A few simple creases evoke an animal; modify the
sequence slightly, and an entirely new beast appears. To the Japanese sensibility, the
success of a completed origami figure depends on the creator's eye for form, structure
and proportion."* (ENGEL, 1994).

Origami is the art of folding ordinary sheets of paper into decorative objects
(sculptures). The popular term "origami", derived from the prior name *orikata*, has
been used since the 1880's and is a combination of the Japanese words *oru*, to fold,
and *kami*, paper (MONTROLL, 1990). The occidental name proposed for this prac-
tice is papiroflexia (KNEISSLER, 1989). Buddhist Chinese monks introduced the
techniques of paper making to Japan in the 6th century (LANG, 1988) and, it is
thought, the simplest origami designs as well. After this, the art was developed
over a period of fifteen centuries in Japan, where it was practically autochthonous
during the last 400 years (LANG, 1988; MONTROLL & LANG, 1991). In their
origin the origami folds developed were very stylized representations of animals,
costumed people, or ceremonial designs for the shintoist religion, decorating tem-
ples and residences. The origami practice received a tremendous boost in the west-
ern world only after the 1950's, from the development of a systematic terminology
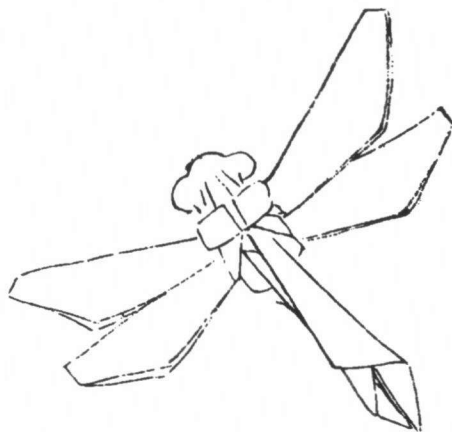
Fig. 1. Reproduction of the dragonfly origami fig-
ure, as appeared in *Kan-no-mado* (Japan, ca. 1850).

applied to the project instructions. As a resourceful form of handicraft, it has been especially used as an auxiliary activity in the education of children.

There are numerous representations of dragonflies in origami, showing the popularity of these insects, especially in Japan. A dragonfly model had already appeared in one of the earliest existing sets of origami instructions, the classic *Kan-no-mado* ("window on mid-winter") (ca. 1850) (Fig. 1), that compiled medieval documents (BUISSON, 1990; ENGEL, 1994).

The purposes of the present work were: (1) to gather and register a number of diverse origami projects representing dragonflies; — (2) to fold (construct) and present these origami models; — (3) to describe the origami techniques used in each model; — (4) to recognize the dragonflies' structures represented in each model; — (5) to define a basic outline of a dragonfly as seen in origami models.

## THE ORIGAMI MODELS

Sixteen origami projects, most popular, published or suggested by the following authors, among others, were used for this study: ASAHI (1991), AYTÜRE-
-SCHEELE (1990), BUISSON (1990, suggested), ENOMOTO (1991), HANDA (1992), HONDA (1993), ISHIBASHI (1987), KASAHARA (1967; 1973, suggested), KNEISSLER (1989, suggested), KUMASAKA (1990), LANG (1988), NAKATA (s.d., modified), TANAKA (1994). Following the Japanese tradition, the paper used for the construction of the models was a very thin kind with only one side colored (Figs 2-17).

The uses of the following origami techniques were recorded and described for each model: number of sheets of paper; form of sheet(s); type of base (preliminary steps of traditional origami); presence and number of cuts; "inside-out" use (colour contrast of different parts obtained by the exposition of the two sides of the paper); display in two- or three-dimensions; number of polygons formed in the opened sheet(s) of paper (as an indicative of complexity) (Tab. I).

The recognizable structures of dragonflies represented in the models are: head, eyes, "face"/antennae, thorax, wings, pterostigma, abdomen. The head or eyes, wings, and abdomen are always represented (Tab. II).

Table I
Folding techniques used in the origami projects studied

| Authors | Number of sheets | Form of sheet(s) | Base | Number of cuts | "Inside-out" | (X-) Dimension | Number of polygons |
|---|---|---|---|---|---|---|---|
| ASAHI (1991) | 2 | square | - | - | X | two | ?;144 |
| AYTÜRE--SCHEELE (1990) | 1 | square | crane | 2 | - | three | 384 |
| BUISSON (1990) | 1 | regular hexagon | - | - | - | three | ? |
| Carvalho (unpubl.) | 1 | square | frog | - | X | three | 296 |
| ENOMOTO (1991) | 1 | square | square | 2 | X | three | 154 |
| HANDA (1992) | 2 | rectangles (2x1:2) | - | - | X | two | 100;64 |
| HONDA (1993) | 1 | square | crane | 2 | - | three | ? |
| ISHIBASHI (1987) | 1 | square | waterbomb | - | - | two | 96 |
| KASAHARA (1967) | 1 | right triangle | - | - | - | three | 74 |
| KASAHARA (1973) | 1 | square | insect | - | - | three | ? |
| KNEISSLER (1989) | 1 | square | crane | 2 | - | two | 266 |
| KUMASAKA (1990) | 1 | square | waterbomb | - | X | two | ? |
| LANG (1988) | 1 | rectangles (1:2) | - | - | - | two | 348 |
| NAKATA (undated) | 3 | rectangles (1x2:4;2x1:4) | - | - | - | two | 52;32;32 |
| TANAKA (1994) | 1 | square | frog | - | - | three | ? |
| Traditional (various sources) | 1 | square | crane | 2 | - | three | 136 |

## DISCUSSION

More than any other representative form of art, origami appeals for simplicity and economy. Most origamists, particularly in Japan, try to fold models that represent or suggest the minimal features needed for the recognition of the represented object. A minimal increase in the number of displayed structures causes, in general, an inopportune increase in complexity and difficulty.

All the origami models studied were probably inspired by anisopteran dragonflies. When compared with representations of other insects, they are very simple,

Table II
Recognizable dragonfly structures represented in the origami models studied

| Authors | Head | Eyes | "Face"/ Antennae | Thorax (Dorsal) | Thorax (Lateral) | Wings | Ptero- stigma | Abdomen (Dorsal) | Abdomen (Lateral) |
|---|---|---|---|---|---|---|---|---|---|
| ASAHI (1991) | ? | inside- out | - | X | - | 2 pairs | - | X | - |
| AYTÜRE- -SCHEELE (1990) | X | X | - | - | X | 2 pairs (cut) | - | X | X |
| BUISSON (1990) | X | - | - | - | X | 2 pairs | - | - | X |
| Carvalho (unpubl.) | X | X | X | X | X | 2 pairs (i.o.) | X | X | X |
| ENOMOTO (1991) | X | - | - | - | X | 2 pairs (cut/i.o.) | - | - | X |
| HANDA (1992) | - | inside- out | - | - | - | 2 pairs (false) | - | X | - |
| HONDA (1993) | X | X | - | - | X | 2 pairs (cut) | - | - | X |
| ISHIBASHI (1987) | false | - | - | false | - | 2 pairs | - | false | - |
| KASAHARA (1967) | X | X | - | - | X | 1 pair | - | - | X |
| KASAHARA (1973) | X | ? | - | - | X | 2 pairs (false) | - | X | X |
| KNEISSLER (1989) | X | X | - | X | - | 2 pairs (cut) | - | X | - |
| KUMASAKA (1990) | ? | inside- out | - | inside- out | - | 2 pairs | - | X | - |
| LANG (1988) | X | X | - | X | - | 2 pairs | - | X | - |
| NAKATA (undated) | ? | X | - | - | - | 2 pairs | - | X | - |
| TANAKA (1994) | X | - | - | - | X | 2 pairs | - | - | X |
| Traditional (various sources) | X | - | - | X | X | 2 pairs (cut) | - | - | X |

and all of them, except the model of LANG (1988), are in the Japanese style (developed from traditional bases). All the models may easily be reduced to two dimensions. The outline of a neuropteroid insect would probably be similar, but dragonflies are far more popular insects, and origami representing adult neuropteroids were not found in the literature.

Observing the sixteen dragonfly models folded, the outline of the basic geometric representation of a dragonfly may be so defined: a six-pointed silhouette composed by an elongate trunk, truncate in one extremity (suggesting the head) and pointed in the other (suggesting the apex of the abdomen); near the truncate ex-
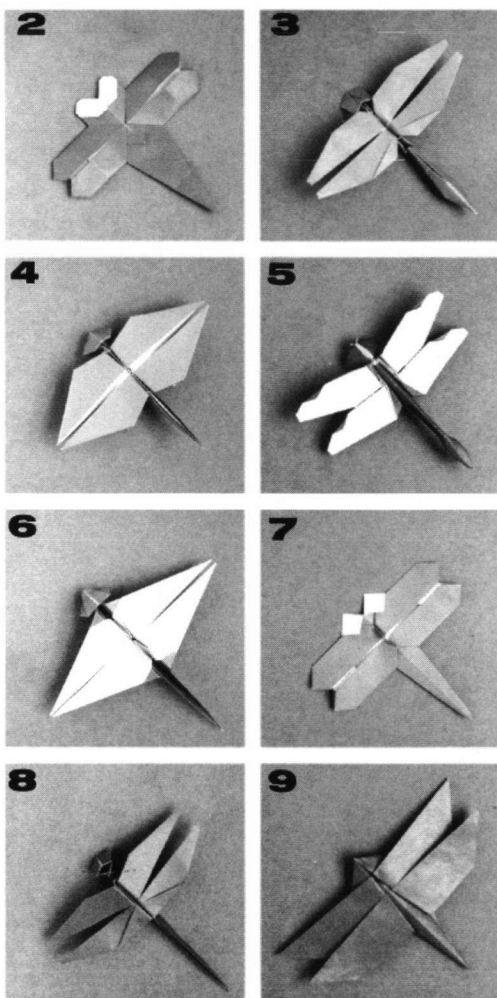
Figs 2-9. Dragonfly models of the following authors or sources: (2) ASAHI (1991); – (3) AYTÜRE-SCHEELE (1990); – (4) BUISSON (1990, suggested); – (5) Carvalho (unpublished); – (6) ENOMOTO (1991, suggested); – (7) HANDA (1992); – (8) HONDA (1993); – (9) ISHIBASHI (1987).

tremity (subapical), two perpendicular expansions originate from each side (suggesting parallels wings); the portions of the trunk representing the abdomen and those representing the wings are two or more times longer than wide.

The principal condition for recognizing a dragonfly is therefore the possession of two pairs of similar and parallel wings. Extreme techniques such as cuts and modules (two or more sheets of paper conjoined) were used to obtain this objective in many models. The origami of KASAHARA (1967), that possess only one pair of wings, is considered to be an exception. In representative terms it is the least accurate, being the simplest one registered. The more elaborate models, like those

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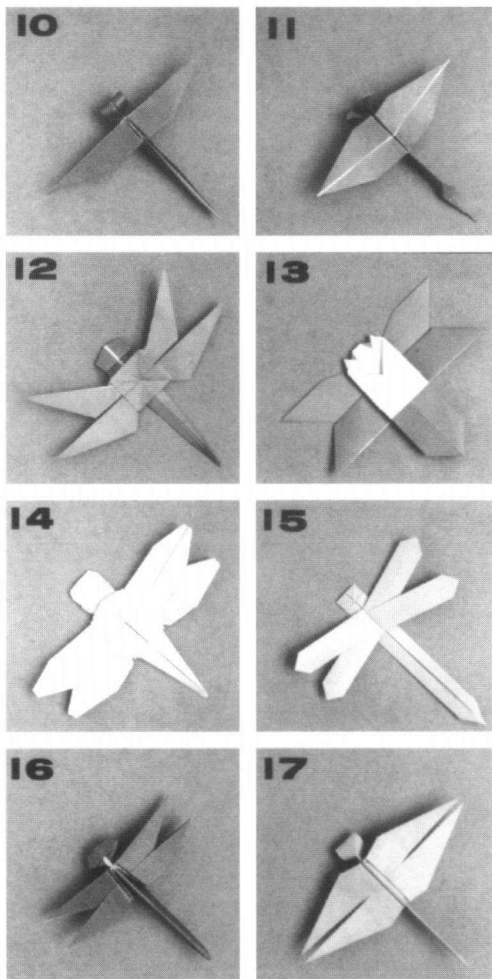


Figs 10-17. Dragonfly models of the following authors or sources: (10) KASAHARA (1967); – (11) KASAHARA (1973, suggested); – (12) KNEISSLER (1989, suggested); – (13) KUMASAKA (1990); – (14) LANG (1988); – (15) NAKATA (s.d., modified); – (16) TANAKA (1994); – (17) Traditional (diverse sourses).

of AYTÜRE-SCHEELE (1990) and LANG (1988), usually do not bear more structures than the simplest ones. Thus, the increase in complexity has been used, in these cases, mainly to round off the outline.

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