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An investigation of bamboo-strips constructions built according to Yona Friedman's manuals

Q2 Q1 **Paolo Chiacchiera**
Politecnico di Torino, Italy

Andrea Bocco
Professor, Dipartin Interateneo di Scienze, Progetto e Politiche del Territorio, Politecnico di Torino, Italy (corresponding author: andrea.bocco@polito.it) (Orcid:0000-0001-5639-5660)

Walter Ceretto
Professor, Dipartimento di Ingegneria Strutturale, Edile e Geotecnica, Politecnico di Torino, Italy

Davide Ghirardotti
Politecnico di Torino, Italy

This paper describes a research study on structural and constructional properties of bamboo strips, used in accordance with some manuals to improve the quality of self-building, which were authored by Yona Friedman. To investigate these properties, four full-scale roof structures of different designs have been built and tested to find their maximum load, deformation behaviour and failure. Two of these have been subsequently rebuilt to explore strengthening possibilities that were assessed through further tests, which showed an increase of maximum load. Besides field tests, the bamboo roofs were modelled making use of a finite-element analysis software, in order to evaluate the correspondence between experimental and analytical data. The results show remarkable differences between the actual behaviour of the structures and that obtained from the modelling, due to the dimensional unevenness of strips and the imperfect execution of lashed joints: the latter not always allowed to obtain that ideal hinge bearing condition, that had been hypothesised in the analytical model.

Notation

E	elastic modulus of the species tested
σ	strain of the species tested

1. Introduction

1.1 Manuals

The manuals by Yona Friedman collected under the title *Roofs* (Friedman, 1991), which are freely downloadable from the UNESCO website, have been produced by Centre for the Communication of Scientific Knowledge (CCSK), founded by Friedman himself in 1982 thanks to the financial support of the United Nations University (UNU), with the aim of popularising scientific knowledge for the benefit of the planet's poor. *Roofs* is but a fraction of a much broader output including manuals on various topics essential to survival, such as food production and preservation, health, water provision, irrigation, energy, communication, self-organisation and of course housing and self-building. Manuals are made up of extremely sketchy drawings coupled with short captions, so to make them understandable to the largest possible number of people.

As it is quite self-obvious, *Roofs* is focused on the (self-) construction of roofs, which are, in Friedman's view, the most crucial and technically difficult part of a dwelling (Friedman, 1991: p. 4). In providing instructions on the construction process of different roofs, Friedman was sparing technical details: manuals are open to the interpretation of users, so as to be adapted to local resources – know-how included. *Bamboo domes* are given a special place in the manuals, not lastly because Friedman had built several of them in partnership with Eda Schaur in the Museum of Simple Technology, in Madras (Friedman and Schaur, 1987).

Friedman conceived his bamboo domes as composed of two parts: an upper, load-bearing dome, which is the focus of this study; and a lower dome, hanging from the upper one, whose function is to bear a waterproof roofing sheet. Domes are based on square frames with a side of about 3 m, with diagonal braces at the corners so to create an octagonal drum. Frames were built of whole bamboo culms lashed with rope. Upper domes were instead made of bamboo strips, which are obtained splitting the culms lengthwise: they appear as a series of interweaving arches, with a joint at each intersection. The geometrical shapes of some of them remind us of Guarini's domes.

It is worth remarking that similar constructions, albeit not totally novel, detached themselves from most bamboo architecture for being made of strips instead of whole culms, as it is common practice both in vernacular and contemporary buildings. In fact, they seem to compare more appropriately to

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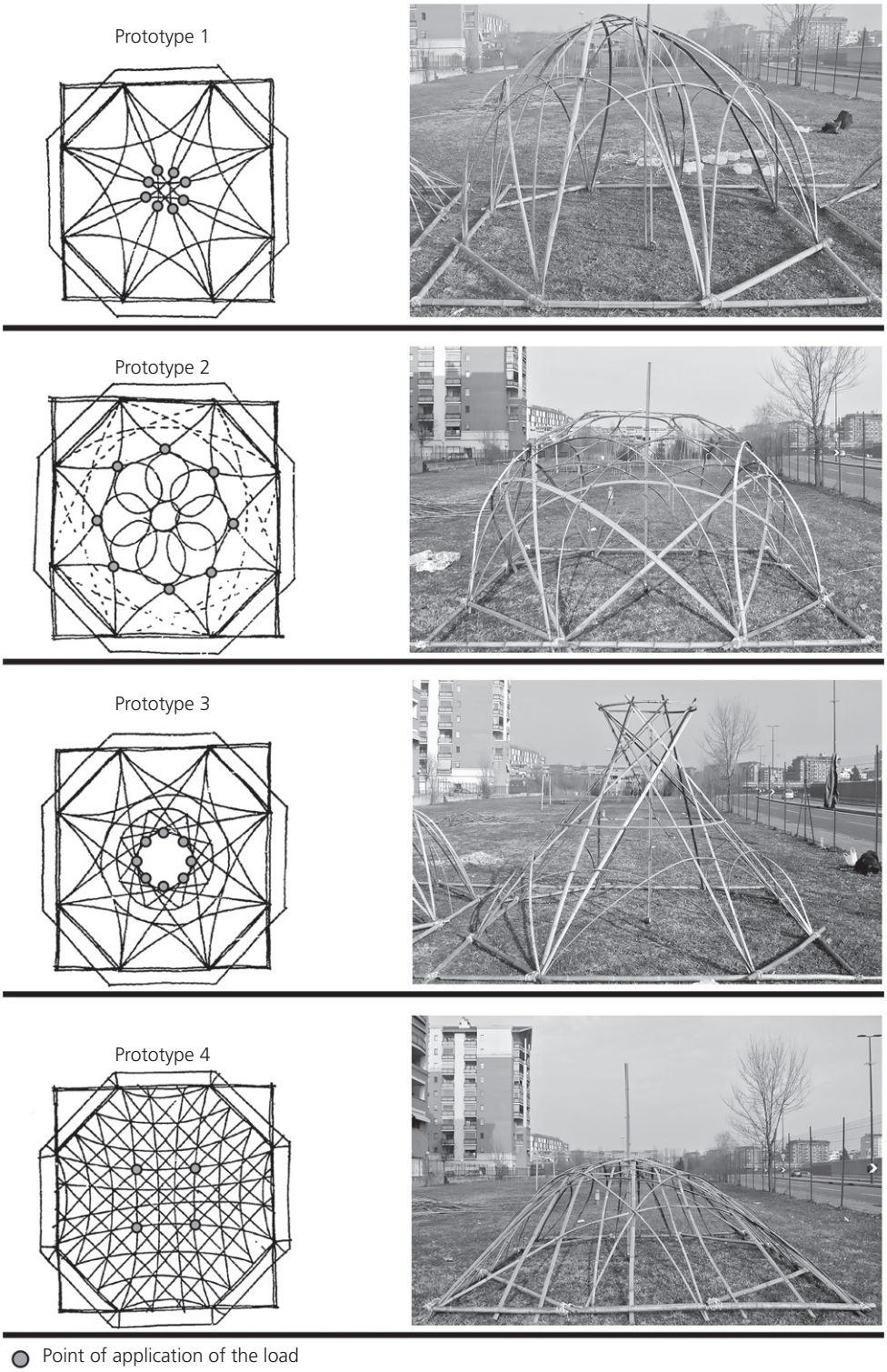


Figure 1. Four prototypes before testing

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basket-making than to framing (see also Section 3). The utterly lightweight (and inherently weak) constructions were in fact meant to bear no more than a waterproof membrane and provide some shade.

1.2 Tested structures

The purpose of the research study has been to investigate the efficacy of Friedman's bamboo domes. The investigation started on four prototypes built by students of architecture during a workshop in May 2015. Clearly, Friedman's manuals were aimed at places where the use of bamboo is widespread and at people with some practical know-how. Students did not possess a similar knowledge. Problems encountered with the first prototypes – including weakness of joints between bamboo strips, uneven dimension of elements and irregular geometry of assemblages – were heavily affected by such lack of experience. Subsequent research tried to solve such flaws; and during the workshops held in January and June 2016, students were guided by tutors.

Prototype 1 is a central geometry dome: a hemispherical dome with four rods stemming from each junction of the base frame. Two of them cross at the top of the dome, while the other two diverge laterally giving rise to segmental arches.

Also prototype 2 is a central geometry dome with four rods stemming from each junction of the base frame. However, here the bamboo arches cross at lower points, and the top region of the dome consists of a system of nine rings. Such rings are obtained by curving a bamboo strip and tying together its overlapping ends, obtaining a circle about 70 cm in diameter.

Prototype 3 is a tapered dome – more precisely, a hyperbolic paraboloid – with also four rods from each junction, two of which are connected to the top ring at diametrically opposed points. The remainder two strips remain lower diverging at the sides, and stiffen the lower part of the dome. Compared with the other three ones, this prototype is much slender and has a larger number of intersections between rods and therefore a larger number of joints.

Prototype 4 is an orthogonal grid dome which resembles a grid-shell in shape and behaviour (Figure 1).

To sum up, there were two hemispherical domes (1, 2), a paraboloid (3) and a dome with a parabolic cross-section (4). The bamboo used was *Phyllostachys viridiglaucescens*. Polyester and polypropylene ropes of 3 mm were tried, obtaining good results in terms of handling and tightening, but (to keep the overall construction as based on natural materials as possible) tests were carried on prototypes whose joints had been lashed with a 4 mm thick hemp rope (critical load = 90 kg).

1.3 The virtual prototypes

The investigation of virtual prototypes with general structural analysis (GSA), a finite-element analysis software produced by Oasys – allowed to understand the behaviour of the bamboo domes, in spite of the necessary simplifications that had to be introduced. For instance, perfect standardisation of elements is

Table 1. Mechanical strength of some bamboo species

		Traction			Compression			Bending		
Species	**Researcher (Reference)**	σ: N/mm^2	E: N/mm^2	**RH: %**	σ: N/mm^2	E: N/mm^2	**RH: %**	σ: N/mm^2	E: N/mm^2	**RH: %**
Bambusa blumeana, Philippines	Janssen (A)				78·0	18 800	12	84·0	20 500	12
B. blumeana, Philippines	Janssen (A)				80·0	18 800	87			
B. blumeana, Philippines	Janssen (A)				83·0	18 800	4			
Bambusa pevaribillis, China	Yuen (A)				45·8	15 200				
B. pevaribillis, China	Yu & Chung (A)				79·0	10 300	<5	80·0	22 000	<5
B. pevaribillis, China	Yu & Chung (A)				48·0	9300	5–20	50·0	18 500	5–20
B pevaribillis, China	Yu & Chung (A)				35·0	6800	>20	37·0	16 400	>20
Guadua	Puccinelli (B)	1500			39·0	18 800		70·0		
Guadua, Colombia	Lozano (C)	61·4		93	32·9		87	68·4		71
Guadua, Colombia	Lozano (C)				55·0		dry			
Guadua, Costa Rica	Sotela (A)				42·0	27 000				
Oreobambos buchwaldii, Malawi	Ngoma (B)	1800			43·0	11 860		1080		
Phyllostachys pubescens, China	Yuen (A)				44·6	11 300				
P. pubescens, China	Yu & Chung (A)				1170	9400	<5	51·0	13 200	<5
P. pubescens, China	Yu & Chung (A)				46·0	7800	5–30	56·0	11 400	5–30
P. pubescens, China	Yu & Chung (A)				44·0	6400	>30	55·0	9600	>30
Phyllostachys	Glenn (A)							1460	14 800	

References: (A) Chung and Chang (2002); (B) Puccinelli (2007); (C) Trujillo and Lopez (2016)

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impracticable with natural materials, but in the virtual prototypes it was assumed that all bamboo strips had a constant and homogenous section. Moreover, as the effectiveness of hand-made lashes depends on the builders' skill (so that one cannot obtain the same degree of constraint in each joint), all bearings were assumed as hinges. This assumption was due to the fact that it was not possible to estimate the sliding of strips over one another – a phenomenon which actually occurred during field tests.

Mechanical characteristics of bamboo depend, among other things, on the species; in literature quite different values can be found even for the same species (Table 1). As characterisation of the material was beyond the scope of this research, which was focused on building process and structural forms for stress and displacement calculations, an average value for *P. viridiglaucescens* was taken from literature. For non-linear analyses, it was assumed that $E = 11\,400$ MPa. The moisture content was actually measured: the mean value of samples being 10·25% for those used in January 2016 and 10·27% for those used in June 2016. Such values fall in the usually recommended range. Q3

Finally, it immediately became clear that every arc that makes up the structure is subject to compression: given the

Table 2. Displacements and loads in the four prototypes studied during the first series of tests

Load: kg	32	40	42	48	64	80	96	100	108	112	128	130
Displacement: mm												
Prototype 1	40	200	x									
Prototype 2					60		150				250	x
Prototype 3	20				60		90		120	x		
Prototype 4	10			40	70	100	140	x				

x = failure

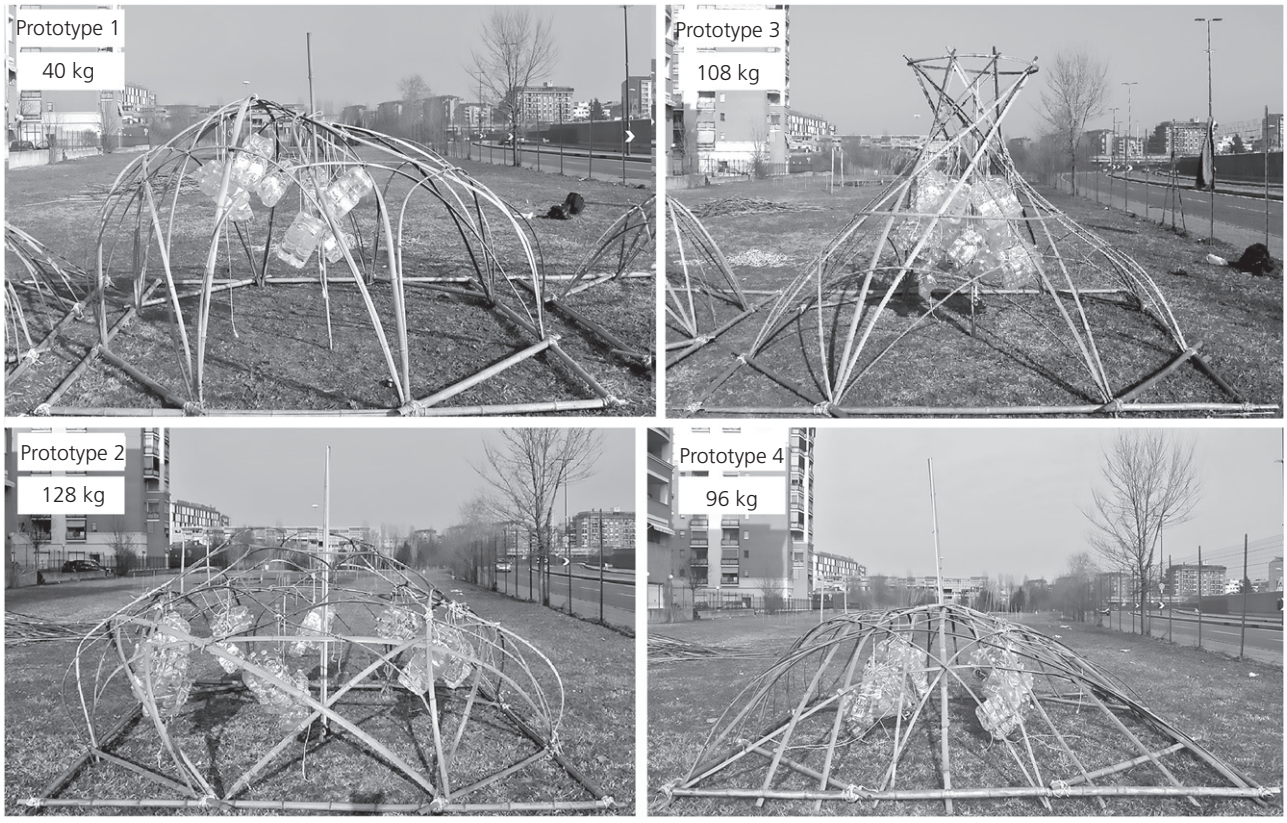


Figure 2. Prototypes at loading with 2–4 kg less than their respective failure threshold

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slenderness of the elements, instability problems tend to appear quickly. Therefore, a non-linear analysis has been necessary, in order to take into account the displacement of the load configuration as a result of deformations.

2. Tests: results and discussion

2.1 Methodology

The tests consisted of loading the structure progressively, hanging the load from symmetrical points (indicated by dots in Figure 1), although deformation under load was never symmetrical in practice (Figure 2). The addition of load to the structures was continuous during a few hours, therefore allowing no time for the structures to fully creep under load. At each increase in the load, the lowering of the structure at the central point was measured.

Two series of tests were carried out on the bamboo domes: the first (see Section 2.2), held in January 2016, concerned the four prototypes described in Section 1.2. In the second series (see Section 2.4), held in June 2016, the improved versions of prototypes 1 and 4 were tested, that had been built in May 2016 according to the results of previous observations (see Section 2.3). In particular, both the joints at the base frame and the connections between the strips were improved; moreover, in prototypes 1B and 4B each rod was composed of two bamboo strips.

For each prototype one single sample has been built and tested. Therefore, the results of tests cannot be considered statistically significant in terms of determining the mechanical strength of each structural form; the purpose was rather to compare such structural forms to see which was the stronger and why, and to appreciate if those that appeared to be improvements had actually produced stronger constructions.

2.2 First series of tests

Load tests performed in January 2016 have led to the results reported in Table 2.

Substantial differences in the ultimate strength values are due to several factors: the dimensional difference of the strips (10–40 mm in width and 3–8 mm in thickness), together with the imperfect regularity of their arrangement, led to



Figure 3. Prototypes at failure

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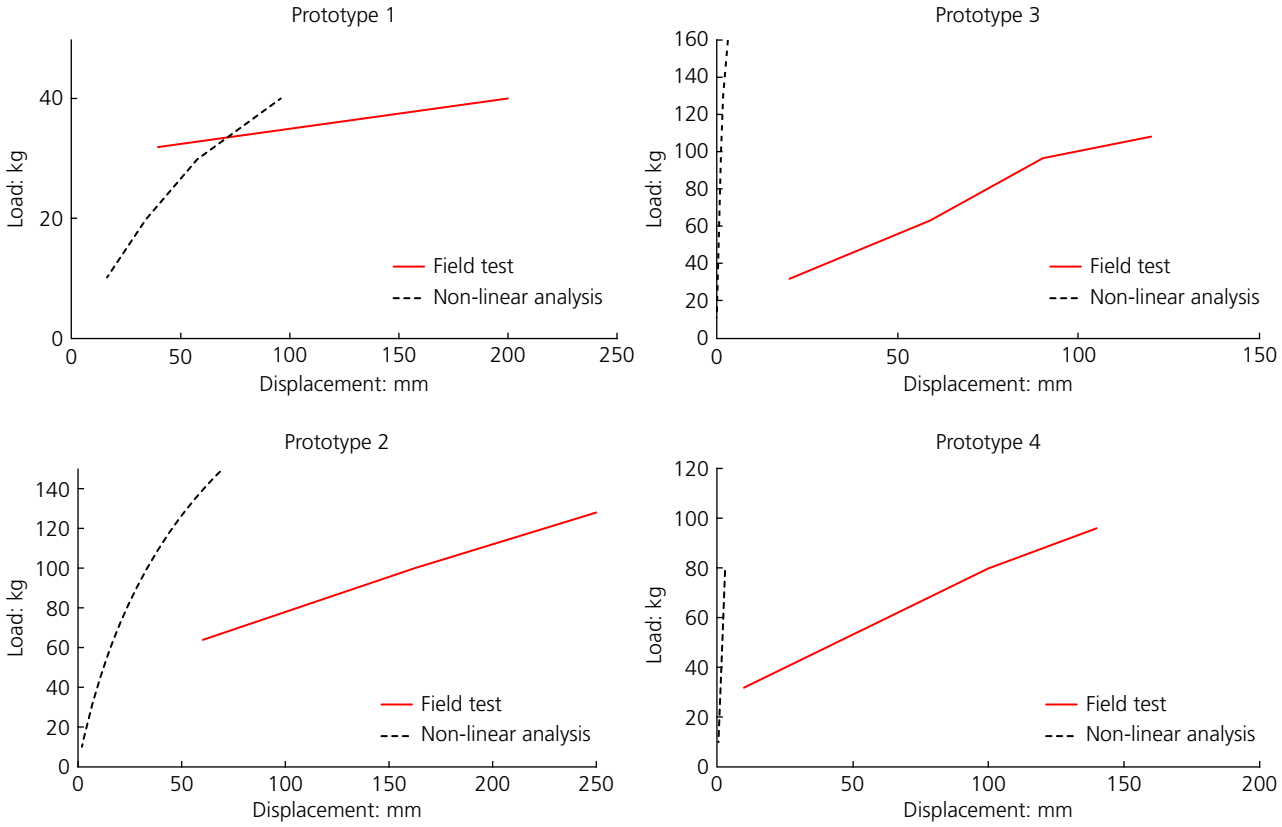


Figure 4. Load–displacement graphs. Field test results are indicated with solid lines and non-linear analysis predictions are indicated with dashed lines

asymmetrical deformations; the choice of the points of application of loads, moreover, affects the amount of load carried, as can be seen in prototype 1, where the placement of the loads almost at the top of the dome leads to the collapse of the structure much earlier than, for example, in prototype 2 where the loads are hung from more lateral knots.

Except in prototype 4, the break occurred at the intersection of strips, where the lashing transfers stresses from one element to another. In prototype 4 there was no breakage of the rods: the test had to be interrupted before failure as the weights touched the ground as a consequence of the lowering of the structure, so it was not possible to increase the load anymore (Figures 2 and 3).

Comparing the results obtained, one can notice an important discrepancy, albeit less evident in prototype 1, where the number of joints is smaller (Figure 4). Possibly, the reason is that while in the virtual prototype it was assumed no rod sliding at overlaps, actually a crossed lashing, although well executed, does not guarantee a perfect hinge – which could have been obtained with a pin in a hole (this detail was rejected so as not to weaken the section at a point where the flexural stresses are highest: bamboo is weak in shear and tensile strength orthogonal to the fibres, so holes are always critical). Ultimately, in the prototypes with a high number of connections, the discrepancies between experimental and analytical results are greater.

2.3 Improvements to the prototypes

The first series of tests revealed several critical issues. In a workshop held in May 2016, a new version of two domes (prototypes 1A and 4A) was built introducing some changes to prototypes 1 and 4, respectively, to improve their efficiency.

In the first place, the study of knots from basic sailing practice led to a way of lashing that is simple to realise and effective against sliding: repeated at each intersection between rods, it produced a more even distribution of stresses and a homogeneous overall behaviour, avoiding excessive local deformations.

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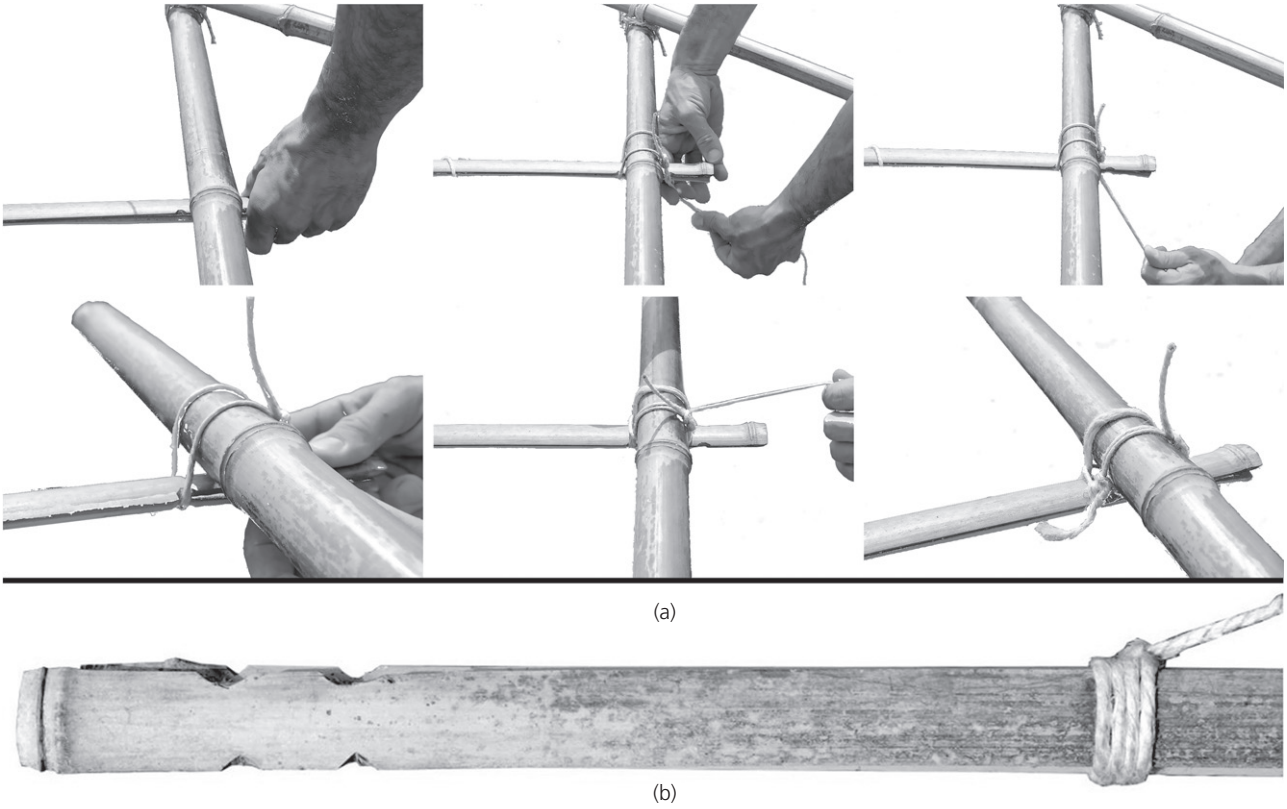


Figure 5. (a) Sequence showing how one of the dome strips is lashed to a base frame culm. (b) Detail of notches carved on the edges of a bamboo strip

Moreover, at the junctions between the dome and the base frame, where the almost vertical direction of the stresses involves a greater risk of sliding, small notches were cut on the edges of the bamboo strips, in which the rope was passed (Figure 5). The notches were carved by removing the least amount of material possible, to minimise the weakening of the section. During the tests, no rope slipping nor bamboo breakages were observed at these points. This solution is different, but compares with what Toki and Nagai envisaged in their 'Bamboo ark' to prevent slippage at joints (Toki and Nagai, 2015).

A further amendment (implemented in prototypes 1B and 4B) was to couple two bamboo strips and therefore double the section of the arched elements. In this case, each rod was obtained by tying together two strips of bamboo at about every 40 cm, so as to create a relatively solid element, comparable to a lamellar rod (Figure 6).

Two central geometry domes and two orthogonal grid domes were built – that is, each of these two models in both the single-strip (respectively, 1A and 4A) and double-strip (respectively, 1B and 4B) versions. The construction of such prototypes was carried out in accordance with the same procedures, so as to allow the comparability of the results. The dimensional homogeneity of sections was also checked more carefully than in the previous workshop, so as to minimise weak points.

2.4 Second series of tests

In the second series of tests, loads were progressively applied on a $100 \times 100 \times 2$ cm wooden board. This expedient simplified the operation of increasing the load, obtaining at the same time an even distribution at all the points of application.

Prototype 1A showed a better response to load compared with the prototype 1. In addition to having considerably smaller displacements, it collapsed when charged with a load over three times larger (130 kg).

The results of prototype 1B are even better and almost directly proportional to those of prototype 1A: the displacements are about one-half, the ultimate load is slightly more than double (270 kg). Unlike the first series of tests, there were no

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Figure 6. 'Lamellar rod' created coupling two bamboo strips (side view)



Figure 7. Comparison of loading and deformations in prototypes 1A and 4A to their respective 'enhanced' versions, 1B and 4B

transverse cracks in the rods, but strong torsions and longitudinal splits, contained by the ties.

The displacements recorded for prototype 4A are close to those of the prototype 4 until a load of 100 kg. At this point prototype 4 had collapsed, while 4A reached 156 kg. Here it is the interlacement which keeps the rods together when they displace vertically: the contribution of lashings is less essential. For this reason, enhancing the ties is less influential on the strength of the structure compared with prototype 1A. The structure was symmetrically deformed, demonstrating the good load distribution of the grid arrangement.

Prototype 4B showed significantly smaller displacements than 4A; the difference in behaviour gradually increases with the load (Figure 7) (see test results in Table 3).

It may be interesting to compare the weight (dead load) of the structures built in this second phase and their ultimate loads

- Prototype 1A had a weight of 18·7 kg (11·2 kg of strips, 7·5 kg of whole culms) and supported 130 kg; 1B weighed 25·9 kg (18·4 kg of strips, 7·5 kg of culms) and supported 285 kg.

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Table 3. Displacements and loads in the four prototypes studied during the second series of tests

Load: kg	30	50	70	90	110	130	150	170	190	210	230	250	270	290	310	330	350
Displacement: mm																	
Prototype 1A	25	55	88	115	140	195											
Prototype 1B	18	27	48	67	80	88	95	116	122	135	155	172	236				
Prototype 4A	25	50	75	105	145	173	230										
Prototype 4B		11	66	85	90	118	132	147	175	188	210	228	247	285	333	485	530

- Prototype 4A weighed 20·2 kg (12·8 kg of strips, 7·4 kg of culms) and supported 150 kg; 4B 28·8 kg (21·4 kg of strips, 7·4 kg of culms) and supported 348 kg.

Therefore, the ratios between dead load and ultimate loads were, respectively, 1 : 7, 1 : 11, 1 : 7 and 1 : 12.

3. Conclusions and future work

The difference in mechanical performance of the analysed domes is quite patent. The orthogonal grid dome (prototypes 4, 4A, 4B) was the most efficient. Although this model is composed of a greater number of rods, the main advantage is that the interweaving of strips implies much more friction and creates a much stiffer assembly than simple lashed joints of the reciprocally tangent elements, which compose the other dome models. Another advantage consists of the fact that the individual arches lay in vertical planes, as instability problems outside of the plane of the arches are reduced.

It was deduced that it was not by accident that a number of researchers have been trying to transpose the 'basket weaving principle' into civil engineering, given the inherent lightness and strength of this arrangement of very thin and possibly very low-cost vegetal-origin elements, which can be assembled even with a basic crafting skill. To name but a few attempts, see the bamboo grid-shell experimentations carried out at Frei Otto's IL (in particular Fritz *et al.*, 1985; Gaß *et al.*, 1985; Schaur, 1985), and more recently, the earthquake resistant 'woven timber system' by Shankar (2016) and also, to some extent, the 'bug dome' installation in Shenzhen by WEAK! architects (Beckham, 2009; Lyons, 2009).

A continuation of this work could concern the study of bamboo lamellar arches, focusing mainly on the shape of the arch and on the joining techniques between the strips (or lamellae). Similar elements have already been built in the past by Marcelo Villegas (Minke, 2012: p. 54) and by Gernot Minke at the Building Research Laboratory (FEB) of the University of Kassel (Minke, 1985, 1999: p. 36, 2012: pp. 55 and 61). Unfortunately, it seems no scientific literature describes the performances of these experimental prototypes.

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REFERENCES

Beckham R (2009) WEAK! Architects at Shenzhen Hong Kong Biennale. Designboom. Seehttps://www.designboom.com/architecture/weak-architects-at-shenzhen-hong-kong-biennale/ (accessed 10/12/2009).

Chung KF and Chang SL (2002) *Design of Bamboo Scaffolds*. Technical report number 23, INBAR & The Hong Kong Polytechnic University. Q4

Friedman Y (1991) *Roofs*. UNESCO, Paris, FR. See http://unesdoc.unesco.org/images/0008/000876/087695eb.pdf, http://unesdoc.unesco.org/images/0009/000908/090863eb.pdf. Q5

Friedman Y and Schaur E (1987) Museum of simple technology – a tool for development. *Space+Society* **40**: 86–93 Q6

Fritz J, Gaß S, Greiner S, Reiner R and Voigt H (1985) Using vegetal rods for arches, vaults, domes and shells. In *IL31 Bamboo* (Gaß S, Drüsedau H and Hennicke J (eds)). Institut für leichte Flächentragwerke, Stuttgart, DE, Germany, pp. 304–319.

Gaß S, Drüsedau H and Hennicke J (eds) (1985) *IL31 Bamboo*. Institut für leichte Flächentragwerke, Stuttgart, DE, Germany. Q7

Janssen JJA (1995) *Building with Bamboo. A Handbook*, 2nd edn. Intermediate Technology Publications, London, UK. Q8

Lyons N (2009) Bug Dome by WEAK! Dezeen. See https://www.dezeen.com/2009/12/14/bug-dome-by-weak/ (accessed 14/12/2009).

Minke G (1985) Bamboo arch and grid structures. New opportunities for extremely light-weight roof structures made from bamboo. In *IL31 Bamboo* (Gaß S, Drüsedau H and Hennicke J (eds)). Institut für leichte Flächentragwerke, Stuttgart, DE, Germany, pp. 342–347.

PROOFS

Minke G (1999) *Experimentelles Bauen. Ein Werkbericht zum 20-jährigen Bestehen des Forschungslabors für Experimentelles Bauen*. Ökobuch, Staufen bei Freiburg, DE, Germany.

Minke G (2012) *Building with Bamboo. Design and Technology of a Sustainable Architecture*. Birkhäuser, Basel, CH, Switzerland.

Puccinelli N (2007) *Coperture Sismoresistenti in Bambù: Prove Sperimentali ed Aspetti Progettuali per Edifici a basso Costo*. Master thesis in civil engineering, Università di Pisa, Pisa, IT, Italy.

Schaur E (1985) Some characteristic forms of bamboo structures. In *IL31 Bamboo* (Gaß S, Drüsedau H and Hennicke J (eds)). Institut für leichte Flächentragwerke, Stuttgart, DE, Germany, pp. 320–337.

Shankar S (2016) Revitalizing traditional knowledge and bio-cultural heritage in North-East India. See http://www.sanjeevshankar.com/pdf/Revitalizing-traditional-knowledge-and-bio-cultural-heritage-Sanjeev-Shankar-2016.pdf (accessed 03/2018).

Sharma B, Gatóo A, Bock M and Ramage M (2014) *Engineered Bamboo for Structural Applications*. University of Cambridge, Cambridge, UK.

Toki H and Nagai T (2015) Spatial structure using bamboo as structural material: design and construction of emergency temporary building made of bamboo material (part 1). *AIJ Journal of Technology and Design* **21(49)**: 1007–1012.

Trujillo D and López LF (2016) Bamboo material characterization. In *Nonconventional and Vernacular Construction Materials* (Harries KA and Sharma B (eds)). Woodhead Publishing, Duxford, UK.

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