

Arupa Foundation.6 Family of 3D Turned Forms

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Abstract:

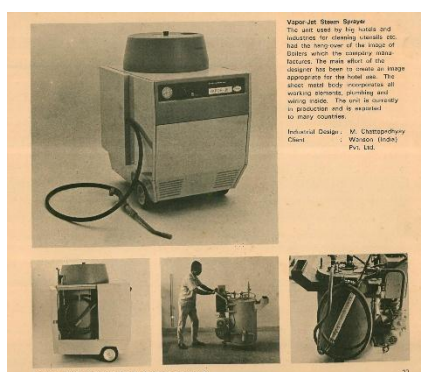
Family of Turned Forms was introduced as a 3D Form exercise at IDC in the 1980s. Students were asked to create four members of a family with a recognizable identity and name, using aesthetic elements such as proportion, radius and flow. This paper revisits the surviving student solutions to reflect in the framework of ‘Arupa the Implicate Order’ to bring out the **pedagogic principles** implicit in the task.

The solutions reveal different ways in which **generative metaphors** can create family identity in 3D Form: through geometric resemblance, abstraction of a distinctive feature, human posture, felt expression, and symbolic abstraction. Naming occupies an intermediate position in generation and communication, while variations within a family provide a means for experiencing how aesthetic elements can change a form without losing its identity.

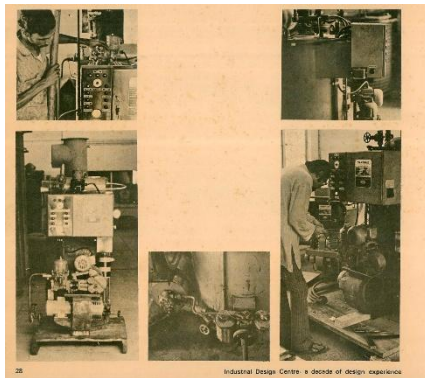
Re-looking at the exercise in the age of AI opens a further pedagogic challenge. AI can rapidly generate and modify alternatives, but these shift the focus from learning of: how to **observe, abstract, imagine and judge what constitutes and sustains family identity**. The reflection suggests that the contemporary value of such a Foundation task lies not in reproducing its forms, but in understanding how a carefully framed problem can create conditions for developing **metaphoric imagination and judgement in 3D Form learning**.

1.Introduction/ Back ground

This exercise done in eighties had an interesting background. In seventies, IDC had done 3 projects, seen below, for a boiler company, Wanson (India) which became Therm O Matic, later. (1) The company had a concept of ‘Family of Boilers’. Typical boiler look was a cylinder common to all their Boiler-products. As each of three boilers got designed, they had less of a family look, as one of the boilers was housed in a clean rectangular box shape to fit into hotel environments. In the next boiler was vertical with elegant look. The third had conventional horizontal boiler cylinder. They started belonging to a *category of products, producing steam, rather than a ‘Family of Boilers’*. The very concepts of ‘Family’ and ‘Category’ were more ‘figural’, which needed more articulation.



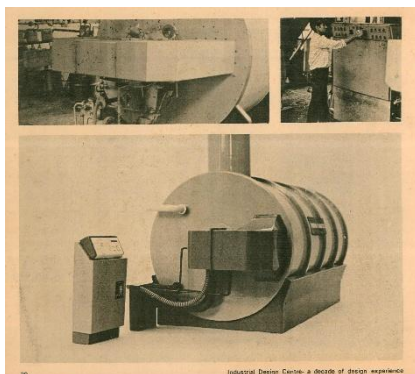
1.1



1.2



1.3



1.4



1.5

My studies at MIT in 1980, brought new insights into Language and Metaphors, which led to the task I introduced on designing ‘Family of Turned Forms’.

This article relooks at the task after four decades, not merely to document its solutions, but to reflect on the processes of imagination embedded in them. In the absence of detailed process documentation, the surviving forms and their names provide clues to how students used metaphor, abstraction and aesthetic elements to generate family identity. Re-looking at the task today also raises questions about its relevance for Form pedagogy in the emerging age of AI.

2. Problem Framing:

Doing a course with Donald Schön and many conversations we had brought me to recognise the importance of Language. I was also exposed to the work of philosopher, Ludwig Wittgenstein, who is known for coining the concept of ‘Family Resemblance’ (2) Typographic fonts are designed as a family. Adrian Frutiger brought focus to the elements that constitute a font-family identity through his design of Univers (1957), in which twenty-one variations were integrated as members of one type family (3). In manufacturing companies Family looks get embedded into ‘Corporate Identity’. Logo and Symbol become unifying elements across 2D and 3D products of a company. Pedagogic material for 2DForm was ample. But Pedagogic material for 3DForm was

missing. My experience with the Boiler project had left memories of engineers' interpretation of family looks in their products, causing mis-fit in new situations of their use. My innovation of the task to explore family looks in 3D forms became timely. I chose exploration of 'turned forms' with family resemblance for the task.

The concept of Family look emerges from the social family in which few features of individuals, a typical nose, facial features, physical structure, voice, etc., carry the physical Identity.

Problem set: Create a family with an identity and name in turned forms. Make 4 units/members of the family, using aesthetic elements like proportion, radius and flow, metaphorically they could become Papa, Mama, beta(son), Betee(daughter).

Faculty: A. G. Rao and Abdul Gaffoor

The task, first of its kind, which brought out thought provoking results in '3D forms' attracted everybody's attention at IDC.

3.0 Looking at the task in Arupa frame work

Figural knowledge gets embedded in studio learning in design (4). Articulation of the processes can reveal the implicate order in Arupa Frame work (5)(6).

Two types of Learnings which took place are looked at to understand the 'figural knowledge' which develops in students as well as 'pedagogic indicators' for Form teaching.

- Hands on/ experiential studio Learning
- Developing Metaphoric Imagination, Abstraction

These are elaborated further.

3.1 Ceramic Studio Experience

Students started their initial ideas by sketching and discussions. Those with Engineering background were familiar with turning on Lathe. But the facility used by students was 'IDC ceramic Studio' headed by ever enthusiastic Mr. Abdul Gaffoor with his skilled assistant Mr. Kishore Patil.

For the task, clay work was not suitable for initial try outs. IDC Ceramic studio had a specially made, motorised wheel for turning in POP (Plaster Of Paris). One could set a POP block on the wheel itself and turn the shape with specially made tools. This innovative machine got fabricated by Abdul Gaffoor. Many students learnt and turned their pieces themselves or by taking help. But it was essential to make a full-scale drawing of the section to start with. Sometimes metal or plastic templates were used to get the required shape. Once the finished POP models were made, hollow POP moulds were made using the POP positive shapes. Mr Patil under the guidance of Abdul Gaffoor had acquired good skill in making POP moulds which were used for slip casting, to get

‘green clay’ models. These were dried, before they were put in a furnace for biscuit firing at 600°C to 700°C, temperature.

To get the glazed finish a coating of chemical for glaze was sprayed and later fired at 1300°C. Lot of help came from the ceramic studio in making final pieces. But there was opportunity for the students, to see and lay their hands to learn.

3.2 Developing Imagination

Main purpose of the task is to ‘Develop Imagination in 3D Form’ with implied ‘Aesthetic sensitization. Geometric configuration required was not complex, as we can see in the results. Metaphoric Imagination and Abstraction involved, have many layers to decode. A look at the physical outputs would be a good starting point in the absence of any recorded dialogues which took place.

4.0 Family of Turned Forms: Solutions

Students who participated in the course.

- 1.Nilesh Desai
- 2.(late)Viswas Hittalmani
- 3.Sanjay Jain
- 4.Atul Kedia
- 5.Peer Sathikh
- 6.Kasmira Rathod
- 7.S.S Badami
- 8.Dipan Shah
- 9.A.H. Shelke
- 10.V.M. Simhan
- 11.GN Sriram
- 12.Nitin Urdhavarsha

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4.1 Peanut Family



4.1.1



4.1.2



4.1.3



4.1.4

4.2. Hamburger Family



4.2.1



4.2.2



4.2.3

4.3 Nandi (Bull)



4.3.1



4.3.2

4.4.0 Padmasana



4.4.1



4.4.2

4. 5. Mudra Family



4.5.1



4.5.2

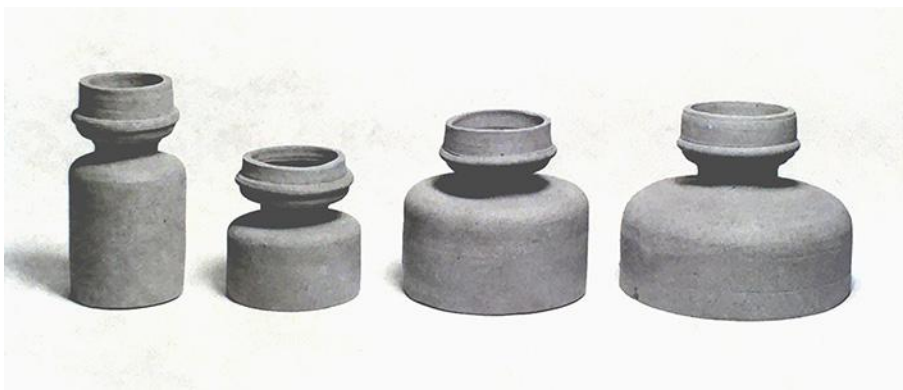
4.6. Mullah Family



4.6.1



4.6.2



4.6.3

4.7 Pathiram Family

(derived from 'Tamil name' YatiPathiram (யதிபாத்திரம்) for a sacred bowl used by monks to collect food)



4.7.1



4.7.2

4.8. Dumb Bell Family



4.8.1



4.8.2

4.9. Hour glass Family

Student: Not recorded



4.9.1



4.9.2

5.0 Abstraction and Metaphoric Imagination

Generative metaphors and Abstraction became 'key constituents in Learning' as the studio protocol demanded 'making of drawings to size' before getting the physical output. This resulted in 'Sketching and dialogues' occupying 'central space' in conceptualisation.

With 9 solutions at our disposal, we can classify them to understand the order of generative process which took place.

5.1 Modes of Generative Metaphor in Creating Family Identity

Mode of Generative Metaphor	Family examples	What is abstracted / selected	How it generates family identity
Geometric Resemblance	Peanut, Hamburger, Dumb Bell, Hour Glass.	Characteristic geometry of the object	A recognizable geometric relationship (bulging, constriction, layering, terminal masses) is varied while retaining across members.
Identifying Feature	Mullah	A strong sub-feature: cap/pagadi	One distinctive feature is selected from the whole and transformed into a recurring geometric element identifying the family.
Postural Abstraction	Padmasana, Mudra	Human posture / gesture	The bodily posture is abstracted rather than the human figure being represented literally; variations of this postural order generate the family.
Expressive Abstraction	Nandi	A felt expressive quality of the bull: “Strong”	The physical bull is left behind. Its perceived character—strength—is translated into proportion, mass, stance and other formal qualities to generate the family.
Symbolic Abstraction	Pathiram – Sacred Bowl	A culturally embedded symbolic form: the sacred bowl	A culturally familiar symbolic form is abstracted into a recurring turned-form identity. Variations in scale and proportion retain the symbolic association while generating the family.

We can see from the solutions, initial task of *creating the family identity* with a name is embedded in final outputs. In the absence of any access to the ‘process documentation’, it is a challenge and an opportunity to decode the embedded process from the clues available.

Strategies adopted by students to arrive at new solutions can be classified into 5 types. Naming points out to the family Identity in each case. We can further examine how these ‘family Identities’ are extended to different members in the family, using aesthetic elements like proportion, radius and flow, etc., suggested in the problem statement. Names chosen indicate generative metaphoric source in addition to providing a frame for communication.

5.1.1 Geometric resemblance

- In ‘Peanut’ the student takes typical bulge coming out of each seed inside. Choosing 3 seeds helped in consolidating the ‘Family Identity’ to facilitate proportional variations with flow. Thus, the variations, Papa Peanut, Mama Peanut, Beta(son) Peanut, Betee(daughter) Peanut become convincing communication metaphors. We can also notice that a strong visual feature of peanut, its texture is left out in the abstraction process intentionally as it would not fit into the scope of the task to complete it, in the given time frame.
- The dominant geometry of loaves of bread holding the ingredients is captured in ‘Hamburger family’. Interestingly irregular geometry of ingredients in the middle is absorbed into a constricted groove, rather than a bulging projection, making it effective aesthetic feature for identity. It makes the family feature not only memorable visually but also felt by touch. Exaggeration of dimensions facilitates to create members in the family.
- Dumb bell as it is, has the rotational symmetry making it easy to convert into a turned form. Two masses are connected with another dissimilar form with rotational symmetry. There is less of surprise in the *generative metaphor* as there is no new interpretation. ‘Family members’ are achieved mostly through scale-variation. No significant ‘play’ or ‘exaggeration’ is seen with variations in aesthetic elements like proportion, radius, mass, etc., reducing the surprise - factor.
- In ‘Hour glass’ also the ‘family identity’ is drawn from geometric features of the existing product. The functional ‘hour glass’ is in transparent material. However, the abstracted turned forms are constrained to be made in opaque ceramic material. So, the flow of form between two volumes with a large radius becomes its main feature

for identity. The solution lacks the play or exaggeration of this feature to bring in the element of surprise.

5.1.2 Abstracted strong sub-feature

- Mullah opens up another group or category based on use of one strong feature of an entity to create the identity of the family. Student adopted a strategy of keeping the 'head gear' or 'pagadi' constant with variations in proportion and volume to create the Family of turned forms.

5.1.3 Postural Abstraction

- Two human postures adopted Mudra (Dancer) and Padmasana (seating posture) brought in to another distinct type. Family variations were achieved keeping the identity of posture with aesthetic elements of balance and symmetry. Later communications revealed Nilesh Desai's 'Mudra' was inspired from dance posture. Though 'Mudra' does not refer to a dance posture, it represents a concentrated expression of energy, intention, and balance. In classical terms, mudras lock in or channel cosmic energy (*prana*). Visually, Nilesh's turned form resembles a vessel where structural lines converge and expand, embodying that exact sense of holding energy.

5.1.4 Expressive Abstraction

- Nandi opened another unique group/category where the family identity was created with a felt expression 'strong', metaphorically derived from a 'physical characteristic of bull'. Aesthetic elements like proportion, mass, stance and radius are used to create the variations in the 'Family'.
The "Hump" and Mass, the heavy, swelling upper shoulders of the vases strongly evoke the powerful, iconic shoulder hump of a majestic Indian Zebu bull (Nandi). The wide, flared bases give the objects a low, firmly rooted centre of gravity. This translates to a sense of immense strength, stability, and meditative stillness associated with Nandi.

5.1.5 Symbolic Abstraction

- Pathiram, taken from Yatipathiram, a sacred bowl, with its name in Tamil, adds an unusual, uniquely cultural type. Peer Sathikh, hailing from Tamil Nadu, a Tamil-speaking state in India, was able to draw from a symbolic category for variations in 3D turned forms. The family of forms speaks for itself aesthetically through its profound sense of groundedness, ritual, and collective harmony. The low, wide,

biconical profiles create a strong visual gravity. They look firmly rooted to the earth, which matches the humility associated with a sacred bowl. Altering the scale and specific proportions across the forms has created a dynamic family, suggesting a group of practitioners sitting in unison.

6.0 Conclusion

What appeared in the 1980s as an exercise in creating a “Family of Forms” can now be seen as an exercise in developing metaphoric imagination. Family identity was not generated by one formal rule. Students abstracted from objects, distinctive features, human postures, felt expression and culturally embedded symbolic form. Naming helped consolidate these emerging identities. The task therefore reveals an implicate pedagogic order: metaphor can act not merely as a means of communication, but as a means for generating 3D Form.

7.0 Playing with AI(LLM): Initial trials

A year back I started using AI (LLM). I started experimenting by asking for same families my students had come out in turned forms and got some quick results with few iterations.

7.1 Peanut Family (with AI)



7.2 Hamburger Family (with AI)



As we can see above AI had its own interpretation. Since no constraints were put, the forms generated had visual exuberance in its depiction. But, the 'Learning objectives' could be easily forgotten with the surprise element in the visual outputs. With some prompt-engineering guide lines when I tried 'Nandi family'.

7.3 Nandi Family (with AI)

I got a visual below with clean turned forms, but the forms lacked the Identity and 'essential form', characteristic of the original form fed.



7.4 Re-formed 'dumb bell' family (with AI)

With increased 'Figural Knowledge' (Knowledge which is acquired through Practice) I was able to generate an alternative (see below) to one of the solutions by feeding in the picture of student solution and then using prompts with corrective measures. It took a few iterations.



8.0 Learning for a Pedagogue

Reviewing and reflecting on the task after several years brings out an important aspect of *semantics in Basic Design*. (7) The concept of *Family*, addressed through this task, brought a new dimension to 3D Form learning. Its implications can extend beyond Foundation learning into professional practice, where an understanding of family identity can contribute to building excellence and coherence in *Corporate Culture*.

Seen in this light, the *Family of Turned Forms* task offers several directions for a young pedagogue designing Foundation learning today. The original problem asked students to create a family with an identity and name, using aesthetic elements such as proportion, radius and flow.

With AI, there is danger of getting confused with the objective of learning in the task. The objective is to develop 'generative metaphoric imagination', i.e., how does one imagine in an unknown territory, not to produce quick solutions using AI. Once a pedagogue is clear on the objective the means to be deployed can be regulated. Arupa framework gives a framework where working order, dialogue process and ecosystem of learning play a significant role and need interpretation in the present context. That is the

challenge for a new pedagogue. Some guidelines are mentioned below to meet such a challenge.

8.1. Ensure support system for making 3D models

Converting ideas into physical realities is a major component in studio learning. IDC support system was unique when the task took place. Every student remembers working late hours in IDC Ceramic studio. Today more powerful tools like 3D printing are available, but involving technical staff who run such facilities as co-instructors will be an important input with increasing number of students an instructor has to handle in a class today.

8.2. Do not over-specify the solution space

A Foundation problem can have clear constraints without prescribing the route to a solution. In this task, turned form, family identity and four related members provided the constraints, while the means of generating that identity remained open. This openness enabled quite different responses to emerge—from geometric resemblance to *Padmasana* and the expressive abstraction of *Nandi*.

8.3. Use generative metaphor deliberately to develop imagination

Metaphor need not be introduced merely as a way of explaining a finished form. It can become a means of **generating form**. *Peanut, Mullah, Padmasana, Nandi* and Pathiram demonstrate different ways of abstracting experience: from familiar geometry, a distinctive feature, human posture, a felt expressive quality or a symbolic, cultural practice. The pedagogue can create conditions for such metaphoric exploration without prescribing which metaphor the learner should discover.

8.4. Teach aesthetic elements through purposeful variation

Proportion, radius, flow and mass need not remain vocabulary to be explained separately. They can be experienced through a question such as: *What can be changed while the family identity is still retained?*

By making variations, the learner experiences how changing proportion strengthens or weakens resemblance, how radius produces flow, or how mass alters felt character. Aesthetic order thus becomes an operative means for exploring identity rather than formal terms to be remembered.

8.5. Use AI to reopen exploration, not to replace it

AI offers the young pedagogue an opportunity to return to a student's solution and rapidly explore alternatives. The pedagogic value, however, lies not in the number of alternatives AI can produce but in the **judgement they provoke**. Has the family identity survived? What has changed? Why does one variation begin to resemble another family? At what point does a *Dumb Bell* begin to read as an *Hour Glass*? Such dialogue

can make the learner observe more carefully and articulate the role of proportion, radius, flow and other aesthetic elements.

In this sense, AI can become part of an *ecosystem of learning*:

Generative Metaphor → Form Exploration → Naming → Communication → Feedback → Further Exploration

The role of the young pedagogue remains crucial: *to frame problems that open imagination, sustain reflection, and develop the learner's capacity to make and judge form.*

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