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Beyond Human-Centeredness: Reimagining Object Agency in Posthuman Design Practice

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Abstract: Human-centered design has long operated as the dominant paradigm within design discourse, prioritizing usability, efficiency, and human cognitive needs. However, accelerated technological development, ecological instability, and the emergence of posthuman perspectives have prompted an increasingly urgent critique of anthropocentric assumptions. This paper presents a practice-based investigation into how agency and expressive capacity may be granted to everyday objects through ambiguous material behaviour, sensor-based interaction, and generative symbolic systems. Drawing from approaches found in speculative design, object-oriented ontology, feminist technoscience, and broader posthuman thinking, this research develops a series of prototypes that destabilize predictable human–object relations. In this framework, the objects do not function as tools but as expressive entities whose behaviours resist linear interpretation, prompting users to reconfigure their assumptions about material agency. User studies show that ambiguity, unpredictability, and distributed forms of agency can encourage new relational modes of interaction and foster ethical reconsideration of non-human actors. The paper concludes by proposing a conceptual model for posthuman design ethics, arguing that design—when decentered from human needs—can serve as a catalyst for multi-subjective, entangled modes of coexistence within complex technological ecologies.

Keywords: Posthuman Design; Material Agency; Speculative Design; Ambiguous Interaction; More-than-Human Ecologies

1. Introduction: From Anthropocentrism to Posthuman Design

Foundational critiques of anthropocentrism have been articulated across speculative design [1], object-oriented ontology [2], feminist technoscience [3], and posthuman theory [4], each challenging the assumption that humans stand at the center of meaning and agency. The paradigm of human-centered design has shaped mainstream design practice for decades. Emerging from ergonomic research and cognitive psychology, it conceptualizes the user as the principal locus of design activity, framing design success in terms of human usability, comfort, and satisfaction [5]. Yet, despite its pragmatic strengths, human-centered design reinforces the ontological hierarchy that positions humans as the exclusive agents within human–object relations.

Simultaneously, broader philosophical and cultural contexts have seen a critical shift toward questioning anthropocentrism. The increasing complexity of technological systems, from machine learning to autonomous devices, challenges the assumption that humans remain the sole decision-makers within interactive environments. Ecological crises also destabilize human exceptionalism by highlighting entanglements between species, materials, and systems that exceed human control.

Within design discourse, these shifts manifest through speculative design and critical design movements. Dunne and Raby's work [6] argues that once objects achieve a plateau of functional optimization, design must move toward the ideological, cultural, and speculative dimensions of technological life. This perspective reframes design as an epistemic tool—capable of questioning sociotechnical norms—rather than simply a problem-solving mechanism.

Parallel to this, posthuman theorists such as Braidotti[4] and Clark [7]call for a reevaluation of human–non-human relations, foregrounding relationality, ecological interdependence, and distributed subjectivity. Clark's recent work emphasizes how posthuman perspectives

destabilize anthropocentric assumptions by highlighting shared vulnerability and entangled agencies across human and non-human actors.

The convergence of these discourses provides fertile ground for reimagining the role of objects within design: not merely as tools or aesthetic artifacts but as active participants in shaping human experience.

Against this background, the research presented in this paper emerges as an inquiry into how objects might be endowed with expressive capacities that resist anthropocentric interpretation. Rather than designing interactive objects that are predictable, obedient, or user-oriented, the investigation explores ambiguity, fragility, resistance, and generativity as alternative modes of object expression. These modes create opportunities to rethink the ethical, relational, and epistemological dimensions of human–object engagement.

1: The paper situates its investigation through three guiding questions:

2: How can objects express themselves without resorting to anthropomorphic metaphor or human projection?

3: What forms of relationality emerge when objects behave ambiguously or unpredictably?

4: How might such interactions contribute to developing a posthuman design ethic?

These questions animate the research methodology and frame the discussion that unfolds in subsequent sections.

2. Conceptual Framework: Toward Object Expression and Multi-Subjective Interaction

2.1 Rethinking Objecthood in Design Theory

Traditional design theory asserts that objects exist to fulfil human needs, communicate functional cues, and respond to human commands. Krippendorff [8] frames design as a process of giving form to artifacts so that users may understand and operate them intuitively, emphasizing clarity, legibility, and interpretative coherence. Within this paradigm, the object functions as a medium through which the designer's intention is transferred to the user. Meaning flows in a linear direction—designer → object → user—reinforcing the notion that the designed artifact is fundamentally passive, its significance determined by human cognition and its purpose constrained by human functionality. Such a model leaves little room for the object's own material dynamics, emergent behaviours, or ontological independence.

However, emerging perspectives in design and philosophy challenge this teleological and instrumentalist framework. Hällnas and Redström's proposition of "slow technology" invites a reconsideration of efficiency as the central metric of design [9]. Rather than smoothing interactions or accelerating human action, slow technology foregrounds temporality, hesitation, and reflection. It positions objects not as frictionless tools but as companions capable of supporting contemplation, slowness, and even ambiguity. Their concept of "meaningful presence" suggests that objects may have value not because they perform tasks effectively, but because they cultivate richer experiential and emotional engagements. This framework decentralizes human objectives and instead emphasizes the shared encounter between human and artifact, opening a conceptual space where objects are not merely used but lived with.

Simultaneously, theoretical developments in sociology and philosophy further destabilize traditional notions of object passivity. Latour's Actor-Network Theory [10] radically reframes the ontology of objects by asserting that they are not inert entities but mediators—participants within heterogeneous networks of humans, machines, institutions, and materials. In this relational ontology, objects do not simply transmit meaning; they transform it. They shape behaviour, structure possibilities, and redistribute agency across networks. A door closer enforces social norms, a speed bump disciplines drivers, and a medical device restructures clinical practice. In this view, objects exert agency not as intentional actors but through their capacity to influence trajectories of action and cognition.

These theoretical developments collectively unsettle the Cartesian dualism that divides subjects (active, knowing) from objects (passive, known). Instead, they propose a post-Cartesian ontology in which agency is distributed, relational, and emergent. Objects are understood as actors embedded within dynamic human–material systems, shaping and being shaped by the interactions that constitute them. They no longer merely extend human will but participate in the formation of practices, affects, and meanings. This shift not only expands the

conceptual scope of design but also foregrounds the ethical and relational entanglements that accompany any human–object encounter, pointing toward a more nuanced, posthuman understanding of what objects are and what they might become within design practice.

2.2 Ambiguity as a Medium of Expression

Ambiguity occupies a central place in contemporary design discourse, not as a mere aesthetic choice but as a critical strategy for destabilizing habitual modes of interpretation and expanding the expressive capacities of objects. Gaver, Beaver, and Benford famously argue that ambiguity enables richer forms of user engagement by shifting the focus from immediate comprehension to interpretive participation [11]. Instead of providing clear functional signals, ambiguous artifacts provoke curiosity, hesitation, and reflection—states that are generally excluded from conventional interaction design, which prioritizes clarity, predictability, and efficiency.

In this sense, ambiguity functions as an antidote to what Gaver et al. call the "tyranny of clarity," a design rhetoric that assumes that user understanding must be instantaneous and unambiguous. By contrast, ambiguous artifacts resist closure. They refuse to deliver singular meanings or obvious roles, and in doing so, they reopen the space of interpretation. This resistance is crucial in promoting a more dialogic human–object relationship in which meaning unfolds through use, consideration, and negotiation rather than through pre-defined functional expectations.

Within speculative design, ambiguity takes on an even more explicit purpose. Malpass identifies ambiguity as a foundational tactic in speculative practice, not only because it invites interpretation but because it dislodges the habitual frameworks through which people understand technological objects [12]. Speculative artifacts often appear strange, irrational, or inexplicable, precisely so they can interrupt everyday assumptions and create room for critical inquiry. Their illegibility forces users to confront the cultural, economic, and ideological structures that normalize certain design conventions.

In the context of this research, ambiguity becomes a theoretical commitment rather than a stylistic flourish. The project deliberately circumvents legible, human-centered cues in order to grant objects a form of expression that does not collapse into human metaphors. The expressive systems developed—rooted in randomness, non-linear responsiveness, and non-linguistic symbolism—seek to decouple object behaviour from human-readable emotional categories. Instead of transmitting messages that users can decode, the objects generate behaviours that must be experienced, interpreted, and situated. Meaning arises not from semantic clarity but from relational interaction.

This form of ambiguity challenges the semiotic model of design, in which objects function as carriers of stable meanings. Here, meaning is not pre-inscribed but emergent, shaped by material behaviour, system logic, and the interpretive agency of the user. The ambiguity thus performs a double role: it allows objects to maintain their non-human opacity, and it encourages users to adopt a more attentive, reflective mode of engagement. In doing so, it supports a broader posthuman agenda by preventing the total assimilation of object expression into human symbolic frameworks.

2.3 Posthumanism and Material Agency

Posthuman theory challenges human-centered epistemologies by emphasizing the fluid boundaries between human and non-human worlds. Braidotti asserts that subjectivity is a distributed phenomenon, emerging from material, technological, and ecological entanglements [4]. Haraway [3] similarly describes worlding as a collaborative activity involving multiple species and systems.

Harman: 'Object-oriented ontology extends this de-centering by arguing that objects possess their own withdrawn realities, inaccessible to complete human understanding' [2]. Objects are not transparent instruments but opaque entities with internal tensions and potentials.

This theoretical lens supports the project's aim of creating objects that resist reductive interpretation. Instead, objects operate as expressive systems whose behaviours unfold through their own logic—material, algorithmic, or emergent.

2.4 Expression without Anthropomorphism

A key challenge in designing expressive objects is avoiding anthropomorphism. Anthropomorphic design risks reinscribing human superiority by treating objects as

incomplete versions of human subjects—or as puppets performing humanized behaviours.

To avoid this, the research adopts abstraction, indeterminacy, and material behaviour as expressive modes. Randomness and non-linguistic symbolism prevent users from reading object behaviours as emotional cues. In doing so, the expressive system foregrounds non-human modes of communication.

3. Methodology: Practice-Led Inquiry and Iterative Prototyping

This research employs a practice-led methodology, developing physical prototypes that test theoretical propositions through material and computational experimentation. Each prototype embodies a conceptual hypothesis about object agency and relationality.

3.1 Prototype A: Silicone Cup — Fragility as Expressive Resistance

Figure 1 is a silicone cup. The silicone cup prototype integrates functional instability into its design. Micro-slits in the base remain sealed under light handling but expand under pressure, causing unexpected leakage.

Figure 1. Squeeze Silicone Cup

3.1.1 Behavioural dynamics

Under normal conditions: The cup appears conventional.

Under compressive force: Liquid escapes unpredictably.

This instability introduces behavioural resistance. Rather than obeying user commands, the cup asserts its own conditions for functional behaviour.

3.1.2 Conceptual implications

The prototype demonstrates how material fragility can function as a form of agency. Instead of simulating emotion, the object expresses vulnerability through mechanical response.

This challenges dominant design ideologies that prioritize durability, predictability, and seamlessness. Instead, the cup cultivates a relational ethic of attentiveness and care. Figure 2 shows photos of a magnetic cup and a silicone cup.

Figure 2. Magnetic Cups and Silicone Cups

3.2 Prototype B

Magnetic Coaster — Uncertainty and Spatial Negotiation.

This prototype involves a cup and three coasters with embedded magnets arranged in distinct polarities. Only one coaster permits stable placement; the others repel the cup.

3.2.1 Behavioural dynamics

Users cannot predict which coaster will align correctly.

Interaction requires experimentation and sensory feedback.

Object behaviour creates spatial negotiation rather than passive placement.

3.2.2 Conceptual implications

This introduces a form of object agency rooted in constraint and refusal. The object becomes a collaborator in action, not merely a substrate for human decision-making.

The unpredictability encourages exploratory behaviour and disrupts assumptions of object obedience.

3.3 Prototype C: Reverse Evaluation System — the Limits of Anthropomorphic Metaphor

An early prototype imagined objects rating users through measurable usage patterns. Although conceptually provocative, this approach reintroduced anthropomorphic metaphors, as user feedback confirmed.

3.3.1 Behavioural dynamics

Users interpreted object ratings as human-like judgments.

The system relied on explicit semantic cues (e.g., scores, evaluations).

The expressive logic remained human-centered.

3.3.2 Conceptual limitation

This prototype illuminated the difficulty of

avoiding anthropocentrism when expressive cues mimic human behaviour. It prompted a shift toward non-representational expressivity, necessitating a more radical departure from anthropomorphic systems.

4. Design Evolution: Ambiguity through Sensing and Generativity

In response to the conceptual limitations of earlier prototypes, the project transitioned to a computationally mediated expressive system integrating: sound sensors, Arduino microcontrollers, serial communication, Processing-based generative graphics.

The resulting system produces visual output triggered by sound but not controlled by it, ensuring expressive autonomy.

4.1 Trigger without Control: A New Interaction Logic

The system functions through a two-layer interaction model:

Trigger layer: Sound presence activates the generative system.

Generative layer: Visual patterns emerge through randomness, independent of sound parameters.

This architecture subverts the cause–effect logic typical of interaction design. Users cannot predict outputs, reinforcing the object's irreducible alterity.

4.2 Non-Linguistic Expressive Modalities

Expression is conveyed through: colour fields, shifting geometries, oscillating intensities, emergent form patterns.

These visuals do not signify emotional states or functional instructions. Instead, they operate as aesthetic events—open to interpretation but not bound by fixed meaning. Figure 3 shows a simulated interaction between an object and a person during the experiment, a process that was completely random.

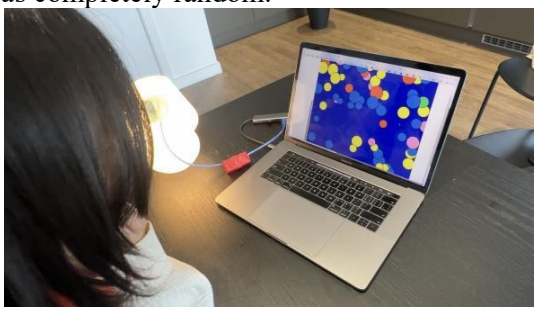

Figure 3. Enables Interaction between Objects and People through Sensors.

4.3 User Studies: Interpretive Phases

Interviews and observations reveal a consistent experiential trajectory:

Phase 1: Confusion

Users attempt to map object responses onto familiar interaction models—control, feedback, usability.

Phase 2: Recognition of Alterity

Users gradually recognize that the object operates through its own logic, leading to acceptance of non-human expressivity.

Phase 3: Exploratory Engagement

Users experiment with different sonic gestures, exploring possibilities rather than seeking functional outcomes. This signals a shift from command-based interaction to relational curiosity.

5. Theoretical Integration: Rethinking Agency, Meaning, and Ethics

The prototypes function not only as artifacts but as theoretical propositions. Their behaviours invite reconsideration of fundamental assumptions about agency, communication, and relational ethics.

5.1 Avoiding Anthropomorphic Projection

By avoiding linguistically encoded meaning and emotional cues, the expressive system resists anthropomorphic interpretation. Instead of simulating human emotions, the objects express themselves through non-representational modalities.

Harman's concept of withdrawn objecthood supports this reading: objects cannot be fully known or reduced to human interpretations. The expressive opacity of the prototypes reflects this philosophical stance [2].

5.2 Relational Meaning-Making

Meaning does not originate solely from the object or the user but emerges between them. Haraway's concept of "sympoiesis" ("making-with") describes how entities co-construct relational worlds through interaction [3].

The prototype system embodies this relationality: expressive patterns emerge through the interplay of user presence, sound triggers, and system randomness. The resulting meanings remain fluid, co-created, and context-dependent.

5.3 Distributed Agency and Multi-Subjective

Systems

Objects within the system exert agency by: shaping user behaviour, resisting predictable control, initiating affective responses, defining conditions of interaction.

This distributed agency aligns with Latour's actor-network theory [10] and Braidotti's posthuman subjectivity [4]. Agency becomes relational, emergent, and materially embedded.

5.4 Ethical Reorientation through Object Expression

The prototypes challenge users to treat objects not as instruments but as entities with presence. Users report adjusting behaviours, speaking softly, or interpreting colour changes as moods—even when the systems were not designed to convey emotional cues. Similar observations have emerged in recent design ethics scholarship, where subtle material behaviours are shown to shift users' ethical orientation toward more-than-human entities [13]. These responses suggest that object expression can destabilize habitual assumptions about material passivity and foster new modes of relational engagement.

This signals an emergent posthuman ethic grounded in attentiveness, care for material others, recognition of interdependence, and respect for opacity. Contemporary work on ecological and relational ethics argues that such sensibilities form the basis for ethical coexistence within multispecies and multisystem ecologies [14]. Rather than dictating fixed moral positions, the prototypes cultivate dispositions that resist domination and instrumentalization. They invite users to inhabit relational modes that acknowledge the agency, unpredictability, and alterity of non-human actors, pointing toward a broader reorientation of ethical practice in design.

6. Expanded Discussion: Implications for Posthuman Design Ethics

The project's findings reveal broader implications for speculative design and posthuman ethics.

6.1 Toward a Non-Dominating Design Logic

Traditional design emphasizes mastery: predictability, control, optimization. The prototypes propose an alternative design logic that values: indeterminacy, emergent behaviour, opacity, reciprocity.

This challenges anthropocentric paradigms that assume objects must conform to human expectations.

6.2 Rethinking Interaction Models

Interaction design often relies on causal mapping: input → output. The expressive system breaks this chain, suggesting that interaction can be relational rather than functional.

This opens pathways for designing artefacts that encourage: reflection, dialogue, interpretation, ethical engagement.

6.3 Material Ecologies and Ecological Ethics

In the context of ecological crisis, the recognition of non-human agency carries ethical significance. Recent scholarship argues that decentering the human is essential for cultivating sustainable and relational ecological practices. By acknowledging objects as participants within interconnected material ecologies, design can move toward more responsible and situated engagements with the non-human world. Recent work in interaction design and multispecies design emphasizes this shift, arguing that design frameworks need to account for non-human agency and more-than-human welfare rather than solely human utility [15,16].

6.4 Implications for Everyday Object Interaction

When ordinary objects behave unpredictably or expressively, habitual relations shift. Users become more attentive, curious, and responsive to the object's presence. Empirical and theoretical research suggests that such expressive non-human behaviour can destabilize consumption habits, foster emotional or care-based ties, reduce pure instrumentalization of objects, and encourage more mindful, ethically oriented use practices [17].

Thus, expressive objects may act not just as functional tools but as catalysts for ethical reorientation, promoting more sustainable, relational, and multispecies-aware forms of everyday interaction.

7. Conclusion: Toward a Posthuman Future for Design

This research demonstrates that design can

meaningfully transcend anthropocentric paradigms by granting objects expressive capacities that resist human-dominated interpretation. By cultivating ambiguity, incorporating sensing-based triggers, and deploying generative symbolic systems, the project constructs a space in which objects emerge not as instruments of human will but as participants within relational networks. The prototypes developed throughout this inquiry do not simply extend existing interaction models; they actively disrupt them. Their unpredictable, opaque, and non-linguistic behaviours reposition objects as agents that shape, negotiate, and sometimes resist human expectations. This shift signals a departure from human-centered modes of design toward a broader ecological and philosophical framing of interaction.

By integrating speculative design methodologies with posthuman theory and object-oriented ontology, this research contributes to an expanding discourse that challenges conventional hierarchies between human subjects and non-human entities. Speculative design provided the methodological and aesthetic scaffolding for exploring alternative futures, allowing ambiguity to function as a critical tool rather than a design flaw. Posthuman theory contributed the ethical and ontological grounding necessary to reposition objects as coexistent beings rather than passive utilities. Meanwhile, object-oriented ontology offered a conceptual vocabulary for articulating object withdrawal, opacity, and internal complexity—qualities that became operational within the prototypes' expressive systems.

Collectively, these theoretical perspectives illuminate the possibility of a design practice in which non-human actants are not subsumed by human interpretive frameworks but instead engage humans from positions of partial autonomy. In such a context, the designer's role extends beyond shaping functional interactions toward facilitating encounters that provoke reflection, unsettle habitual assumptions, and foreground relational entanglement. Design, in this expanded understanding, becomes a method of inquiry into the conditions of coexistence between humans and non-humans within technologically mediated environments.

The study ultimately proposes a posthuman design ethic grounded in five interrelated principles:

7.1 Objects as Participants rather than Tools

Objects are no longer conceived as inert extensions of human intention but as agents whose behaviours, constraints, and expressive dynamics shape interaction. This view reframes objects as contributors to shared relational worlds.

7.2 Ambiguity as a Productive Design Strategy

Ambiguity resists the reduction of object expression into predetermined meanings or emotional metaphors. It encourages attentiveness, interpretation, and open-ended dialogue between users and objects.

7.3 Relationality Superseding Mastery

Interaction is understood not as an act of human control but as a co-emergent process shaped by both human and non-human forces. This shift encourages ways of using, caring for, and engaging with objects that move beyond instrumentalism.

7.4 Distributed Agency across Systems

Agency is not localized exclusively within human actors. Instead, it emerges from the entanglement of material, technical, environmental, and affective conditions. The prototypes illustrate how even simple sensing technologies can contribute to distributed forms of agency.

7.5 Meaning as Emergent rather than Predetermined

Meaning arises through interaction, negotiation, and interpretation. Rather than transmitting information or signalling emotional states, the objects open a space for relational sense-making that cannot be fully anticipated by the designer.

Taken together, these principles articulate a design ethos grounded in posthuman relationality. They challenge the dominance of anthropocentric frameworks and instead foreground the ethical, epistemological, and experiential potentials of non-human expression.

The implications of this research extend beyond the specific prototypes developed. They suggest broader methodological pathways for design practitioners interested in exploring non-instrumental, non-human-centered forms of

interaction. Future research may investigate multi-object ecologies, cross-sensory expressive systems, temporally evolving behaviours, or networks of objects that collectively negotiate meaning with their human counterparts. Additionally, there is potential for applying these principles to fields such as smart home design, environmental sensing, and human–robot coexistence, where the recognition of non-human agency could foster more sustainable, reciprocal, and ethically attuned technological ecosystems.

Ultimately, this research asserts that design is uniquely positioned to cultivate sensibilities suited to a posthuman world. As humans confront increasingly complex entanglements with technologies, ecologies, and material systems, design can serve as a medium for imagining and rehearsing new forms of coexistence. Beyond optimizing utility or facilitating ease, design can create spaces for reflection, ethical encounter, and multi-subjective engagement. In this expanded role, design becomes not only a craft of making but a practice of rethinking how humans and non-humans co-create the futures they inhabit—futures that are necessarily complex, intertwined, and shared.

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