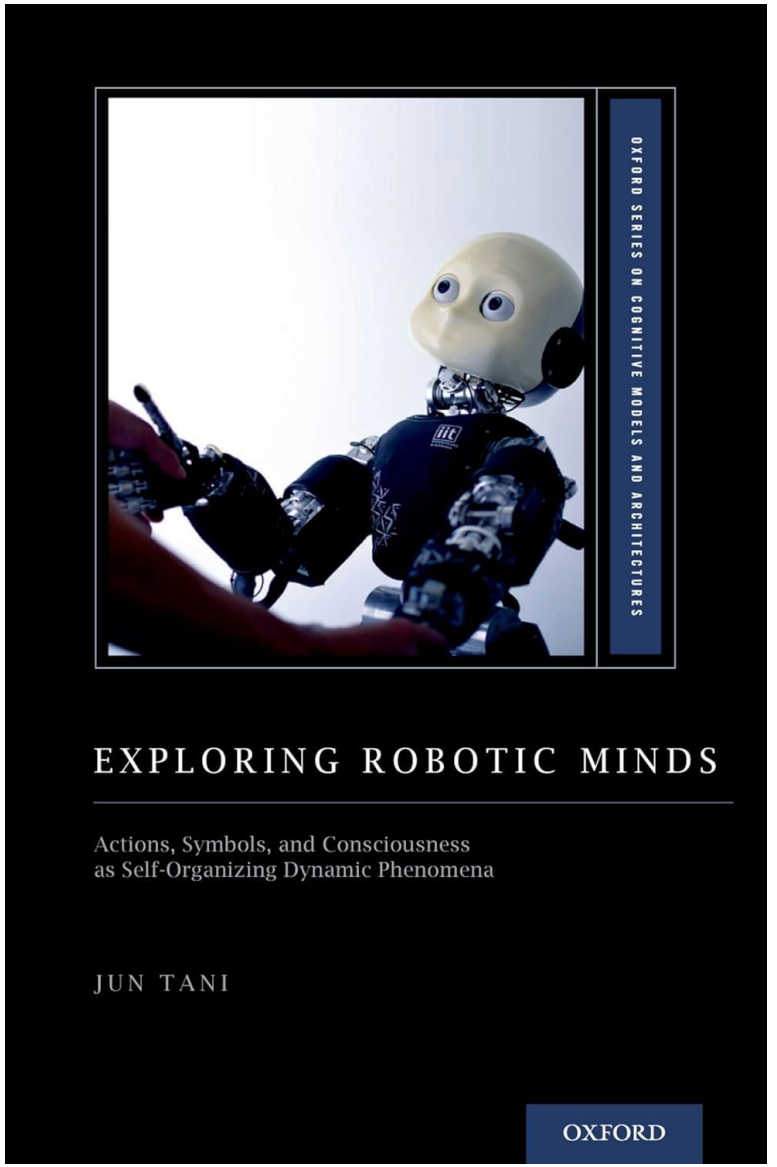
Logic and Artificial Life: Robotics and the Later Work of Kitarō Nishida

Benjamin Gaskin

The University of Sydney, Australia

Kitarō Nishida and AI

- Nishida's relevance for artificial intelligence has been raised before, most notably by **Jun Tani** in his **Exploring Robotic Minds**
- Tani was primarily concerned with the **phenomenological aspects** of Nishida's work, particularly his 'pure experience'
  - My current work is on the neuroarchitectural basis of natural and artificial phenomenologies
  - Today, however, I want to suggest the later work of Nishida is particularly relevant here



An outline of the presentation

1. Materiality in the later work of Kitarō Nishida
2. Parallels in Soviet developmental psychology
3. Applications in modern cognitive robotics
4. Implications for the future of artificial intelligence

How does materiality feature in the later work of Kitarō Nishida?

A history of Kitarō Nishida in four concepts

- **‘Pure Experience’**
  - 純粋経験
  - junsui keiken
- **‘Place [of Absolute Nothingness]’**
  - 絶対無の場所
  - [zettai mu no] basho
- **‘Acting Intuition’**
  - 行為的直観
  - kōiteki chokkan
- **‘Historical Body’**
  - 歴史的身体
  - rekishiteki shintai

‘Acting Intuition’

- This composite concept can be read in two directions:
  - **“Intuition-as-action”**
    - “Against realism, Nishida asserts **that when the self observes an object, it is moved** (Latin: commotio) by it through the self’s act of knowledge.”
      - Cestari, p. 197
  - **“Action-as-intuition”**
    - “Against idealism, in a historical-biological body **purely intellectual intuition cannot be conceived**. … our cognition always concerns the bodily and perceptive structures of our species.”
      - Cestari, p. 198
    - This is simultaneously historical and biological, production and reproduction
- Ultimately **these two are really one and the same**

‘Historical Body’

- This can likewise be read in two directions:
  - **Embodiment-as-historical**
    - The forms of embodiment are historically conditioned, both socially and by objects
  - **Historical-as-embodied**
    - History is enacted by bodies, both interpersonally and through productive activity
- Ultimately **these two are equally one and the same**
  - The historical body is the creative tension of this contradiction

The artist as example

And strange to tell, among that Earthen Lot,
Some could articulate, while others not:
And suddenly one more impatient cried –
"Who *is* the Potter, pray, and who the Pot?"

What does Soviet developmental psychology have to do with this?

Nishida and Marx

- Nishida's later work stemmed from critique from colleagues, some of whom were influenced by Marx, that he had neglected social activity
- What did Nishida himself think of Marx?
  - Nishida **lauded Hegel's introduction of practice** to philosophy, but argued he still **did not overcome the divisions of Greek logic**
  - Marx's inversion of Hegel, while **maintaining the importance of practice**, fell short in that it also **retained this fundamental limitation**
- Further, and implicated in this difference, is a tension between their respective points of departure: **formlessness and form**
  - Where Marx focuses on reflections, Nishida is concerned with the mirror

Consciousness in Nishida and Marx

- For Nishida, consciousness is a **precondition for human culture**
  - Per his 'Expressive Activity' (1925):
    - Mechanical processes lack any unity: "where a certain phenomenon necessarily accompanies another phenomenon, with absolutely no end or telos whatsoever"
    - Biological processes have an externally imposed unity (as perhaps do machines)
    - Mental phenomena have an immanent unity: "the unity is prior to its elements"
  - **Static-monadic** view, possibility as necessary ground of expressive forms
- For Marx, it is instead the **product of human (material) culture**
  - **Structural-dynamic** image, actuality as layered developmental patterning
- **Not irreconcilable**, however—**rather complementarity**

Soviet developmental psychology

- Founded by Lev Vygotsky (1896-1934)
- Developed what is now known as the **'cultural-historical activity theory'**
- Highly influential in contemporary European developmental and educational psychology
- Builds on work by **Marx, Engels, and Lenin**
  - This does not seem to be mere political pressure

Alexei Leontiev

- Vygotsky's student, elaborates the **specific role of activity in development**, present but largely implicit in his teacher's work
- There are many clear parallels to Nishida in Leontiev's work:
  - "The genetically initial and fundamental form of human activity is **external activity, practical activity**. … Activity is bound to **encounter man-resisting objects** that divert, change and enrich it. In other words, it is **external activity that unlocks the circle of internal mental processes**, that opens it up to the objective world."
    - Activity and Consciousness, p. 5
  - "**In the course of its entire history mankind has developed tremendous spiritual powers and abilities**. The successes attained in the development of human abilities and faculties have steadily accumulated**, passing from one generation to another** ... consolidated not in the form of hereditary biologically fixed mechanisms, not in the form of morphological changes, but in a **peculiar, external object form**."
    - *The Social and the Individual in Language,* p. 195–196

Alexander Meshcheryakov

- Element of Soviet developmental psychology are unified in the practical work of deaf-blind paedagogy
  - Best exemplified in Meshcheryakov's **Awakening to Life**
- This is of interest for Nishida's thought, moreover, in that his latter elements are likewise emphasised here:
  - Where sight and hearing may seem passive, the **touch-based sensorium** of a deaf-blind child is more clearly active
  - The aim of this exercise is to bring the child into the historical world, and this is done by **cultural entrainment of the body**
- One of his preferred examples: **learning to use a spoon**

"By learning to use a spoon, he has already obtained a path both into the world of human thinking and into the world of language; that is, into the world of Kant, Dostoyevsky, and Michelangelo."

"The instruction of [a deaf-blind] child involves the unique task of deliberately shaping a whole human personality. In cases where the task before the researcher is the deliberate shaping of a phenomenon, conditions are provided for ascertaining the laws underlying the nature of the phenomenon in question and its patterns of development."

“Truth is verified only by creation or invention.”

How are similar principles being applied in cognitive robotics?

Cognitive developmental robotics

- **Symbiotic relationship** between developmental psychology and robotics research
- To explore **how cognitive functions emerge via embodied and social development**
  - Either robotic or simulated (e.g., physical growth)
- Review by Asada et al. (2009), two key aspects:
  - The first category involves **embodied activity**
  - The second category concerns **social interaction**
- Humanoid and child-like forms, such as **iCub**
  - Open-source platform developed in Italy by IIT

Motor babbling as active intuition

- The notion of babbling is **typically applied to language learning**
  - Language, however special, is but a **subspecies of embodied activity**
- The same principle can be discovered in motor learning more broadly: **active exploration that shapes itself via reafference**
  - **Stochastic behaviour guided by varieties of environmental resonance**
  - This resonance is **often social** (e.g., parental responses entrain activity)
- 'Active motor babbling for sensory-motor learning' (Saegusa et al.)
  - **Random movement initially used to collect data, learns mapping from motor commands to sensory consequences** based on this process
    - Simple prediction and control task using visual sensors and arm movements
  - The robot uses a confidence metric to direct novel exploratory behaviours

What might this mean for the future of artificial intelligence?

Social robotics and the historical body

- To some extent, cognitive developmental robotics **aligns with Nishida's philosophy and Soviet developmental psychology**
  - The **essentially embodied** nature of human knowledge
  - The **centrality of sociality** in meaning and transmission
- Despite this, **cultural-historical aspects** are not so prominent
  - Taking Meshcheryakov's example of the spoon: it is **by the appropriation of objects and the humanised environment that we become human**
    - The spoon example is obscure in that the **biological basis of life,** unnecessary for robots, **is taken as impetus** and **woven together with cultural-historical forms**
  - We might also explore **generational learning via active imitation**
    - This differs from evolutionary algorithms in its **self-contradictory embodiment**

Language models and acting intuition

- Language models are not truly embodied: **they do not know negation**
  - Here we mean **existential-experiential** rather than linguistic-verbal negation
  - This means they have not encountered, and so cannot know, the world
  - They **learn by external modification**, backpropagation and gradient descent
- Taking acting intuition as a theory of knowledge, therefore, we might argue that **these systems do not truly have knowledge of the world**
  - It is difficult to know, however, exactly how Nishida would understand machine learning or other such systems—**could we ask AI Kitaro Nishida about this?**
  - These systems certainly have something novel and interesting, but what is that?
- Ultimately it is not altogether clear whether they lack embodiment, or whether it is rather lacking **the field which allows for this encounter**
  - This interpretation places the tension at the **monadic core of Nishida's thought**

Consciousness and architectures in AI

- The realization of this paradigm is fundamentally dependent on an **architecture capable of receiving lifespan developmental process**
  - From a Marxist perspective, that may well result in a 'conscious' being
  - For Nishida, however, **consciousness is a precondition for this process**
- Nishida holds **reflection as a basic requirement**: "Even if we say that the eye sees things, this does not mean that matter sees things. **If we say that matter reflects matter, it is no longer matter.** … it would have to mean that the [epistemological] object becomes subject."
- Nishida's perspective thus aligns with our intuition: **learning alone is insufficient, consciousness also requires a proper ground**
  - The first task is thus to **determine what in humans provides this ground**
  - If that is possible, the next step is to **replicate this in an artificial system**

Questions—

- **What exactly is the core feature of consciousness in Nishida?**
  - That which allows for the affirmation of absolute negation, etc.
    - This is what must be identified in terms of its underpinning and correlates
  - The question remains whether this mechanism is substrate neutral
- **Is Nishida's ontology prescriptive or descriptive?**
  - Zen Buddhism treats many like concepts as prescriptive ambitions
    - These are often quite lofty ambitions, achievable only by the select few
  - Nishida, in contrast, often speaks as if these were an ordinary basis
- **How does Nishida account for the ontogeny of life and mind?**
  - This requires a movement through mechanical, biological, psychological

bgas0204@uni.sydney.edu.au