

Surrealist Transhumanism: Jean Rostand and Nicole Vedrès's *Aux frontières de l'homme*

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“We are”, writes the mid-twentieth-century French biologist Jean Rostand, “as much the children of the cold, as the children of the sun.”¹ Without the ice ages, we wouldn’t be here; but the powers of the cold continue to play a key role in recent biological research: the cold can rework conventional logics of time and space, disrupt all ideas about what comes next, and make life hold its breath. It may even serve a programme of “intergalactic panspermia.”²

These ideas, which are obviously in need of clarification, can be found in (at least) three of Jean Rostand’s attempts to popularise biological research in the post-war years. First, Rostand speaks about the cold in Nicole Vedrès’s second feature film *La vie commence demain* (1950). Here, he finds himself in the company of six other well-known intellectuals—André Gide, Le Corbusier, Jean-Paul Sartre, Pablo Picasso, Frédéric Joliot-Curie, Jacques Prévert—and is interviewed by the journalist André Labarthe, who plays the role of a young provincial man who goes to Paris to learn about the future. Two years later, Nicole Vedrès and Jean Rostand resumed their collaboration, sharing the credit for the 20-minute film *Aux frontières de l'homme* (*Aspects de la biologie française*) / *At the Frontiers of Man* (*Aspects of French Biology*) (1952). Finally, Rostand recast and developed his ideas about the cold in one of his more than 75 (!) popular science books, nudging the title of the 1952 film—*Aux frontières de l'homme*—ever so slightly further into the future: *Aux frontières du surhumain* / *At the Frontiers of the Superhuman* (1962).³

This essay focuses on Vedrès and Rostand's collaborative film from 1952: *Aux frontières de l'homme*. Despite the fact that the film was edited by Alain Resnais (who had already collaborated with Vedrès on her more famous *Paris 1900*), and shot by Ghislain Cloquet (who would later work with directors such as Jacques Démy, Robert Bresson, Marguerite Duras, and Woody Allen), it has received virtually no critical attention, neither in France nor elsewhere. What is more, only the first five minutes have been subtitled into English. The opening part of this essay undertakes the necessary work of description; the following parts then seek to place the film first in relation to mid-20th century French culture (late surrealism, in particular) and then to twenty-first-century debates about ecology and transhumanism. I will argue that *Aux frontières de l'homme* presents a view of human subjectivity, ecology, and evolution that resonates with numerous non-anthropocentric discourses. What is the nature of this resonance? Ecocritical scholars often dive into the archives to find positive examples of how older films, art, and literature can help viewers (and readers) challenge the idea of human exceptionalism. This is not my aim here. *Aux frontières de l'homme* is too ambiguous to be taken as a positive example; it blends surrealism, non-anthropocentricity and transhumanism in a thought-provoking, charming, and unruly manner that ultimately disturbs its viewers. I aim to show that the film contributes to contemporary debates like a stone to a shoe: it demonstrates how a non-anthropocentric discourse can drift towards transhumanist speculations, and at the same time it challenges recent transhumanist thinkers which are likely to find the film's surrealist elements obtrusive.

Four Speculative Leaps

Aux frontières de l'homme opens with a shot from a car, moving swiftly down a tree-lined countryside road. Rays of sunlight filter through the foliage. On the soundtrack, we hear a harpsichord and a flute playing baroque-inspired music by the contemporary composer Jean-Jacques Grünenwald. A moment later, we also hear Vedrès's voice. She tells us that we are on our way to meet Jean Rostand, the "spokesperson for French biology." He resides not far from Paris, and lives close to the riverbanks that Corot used to paint a hundred years ago. We are looking for answers to life's big questions, trying to comprehend the power that nature holds over humans and other living beings. As the camera finds Rostand by the river, who is fishing for frogs with a big net and wearing a vest, tie, and hat, Vedrès hands over to Rostand, who will narrate the rest of the film with a voice full of enthusiasm, verve, and

“somewhat urgent tones.”⁴ To set the scene for Rostand, Vedrès asks: what are living beings, where do they come from, how are they formed, and how do they develop?

What follows over the next 18 minutes is not only an overview of recent breakthroughs in the biological sciences, but also a series of wild leaps into the speculative realm. The film can be divided into four sections, each of which leads up to such a leap. While none of these sections carry titles, we might ascribe to them the following phrases: “the coming of the matriarchy,” “the invention of a new human being,” “the dream of immortality,” and “intergalactic panspermia.”

“The coming of the matriarchy” begins with the fundamental question of what constitutes a living being. Offering a crash course in embryology, Rostand explains how cells develop into larger organisms. He outlines the various mechanisms for sexual reproduction, describing how the genetic material of male and female cells combine in the egg. He also notes that in the process of reproduction, the female contribution (the ovule) is in many ways more significant than the male spermatozoid. This explains why certain organisms can reproduce by parthenogenesis (or “virginal reproduction,” as the French language put it in the 1950s). Rostand then offers a short history of experiments in artificial parthenogenesis: in 1900 the American biologist Jacques Loeb successfully accomplished the artificial parthenogenesis of sea urchins, in 1910 the French biologist Eugène Bataillon did the same for frogs, and by 1939 Gregory Pingus had made artificial parthenogenesis possible for mammals (rabbits). This string of experiments prepares the ground for the film’s first speculative leap, which is clearly signposted by Rostand’s exalted voice: *maybe* in the year 2000, we will have the asexual reproduction of women who will exclusively give birth to girls?

This opening section is dominated by images of embryological processes, often filmed in extreme close-up, sometimes using micro-photography. For a lay spectator, it is not always obvious what we are looking at, but most images are full of movement, and the descriptions of cytoplasmic processes are relatively easy to follow. Some processes are rendered in time-lapse photography, enabling the spectator to closely follow what Rostand excitedly describes. Many images of plants, animals, and their cells look as if they have been lifted from a surrealist journal such as *Documents* (Fig. 1).⁵ The speculative leap is highlighted through the editing of the film: a spaceship suddenly appears (which in all likelihood comes from a contemporary science-fiction film); and when the idea of a matriarchal society is mentioned, the film cuts



Figure 1. '1900: Artificial parthenogenesis of sea urchins.'

to a close-up of a woman's face, which is also lifted from a film. The woman slowly turns her head while she looks off into the distance, the background is blurred. The music comes to a halt, the editing leaving Rostand plenty of space to introduce the idea of a world increasingly without men, only 47 years away in the future.

The second section of *Aux frontières de l'homme* explores similar territory. Here, Rostand offers an account of how recent manipulations of chromosomes can help to generate new and bigger plants. He also explains how the eggs of different animals, such as salamanders, may be split with a very fine thread, thereby artificially producing twins. We watch this procedure, and Rostand evokes the ways in which biologists—using poisons and x-ray exposure—manipulate animal eggs to trigger “anomalies” and “monstrosities”, such as frogs with up to twenty toes. The scientific justification for these experiments is to understand and prevent any anomalies found outside the laboratories. Having recognised the “troubling” aspects of this research, Rostand performs his second speculative leap: “Maybe one day, by using who knows what on a human embryo, we will be able to improve our brains? This is all it will take to radically alter the destiny of our species. What will these

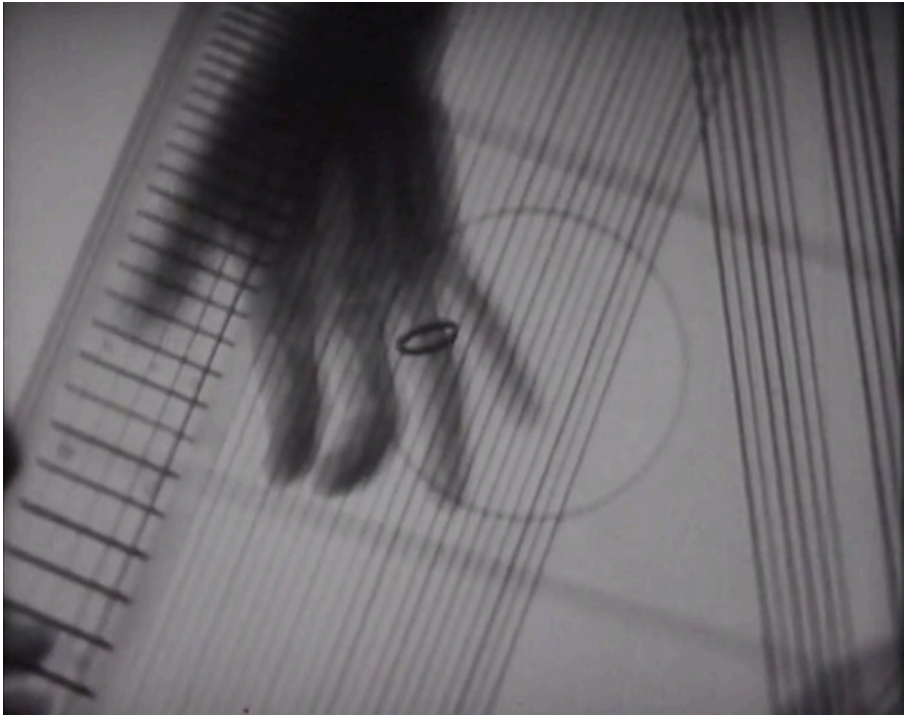


Figure 2. ‘What will these superior monsters be like?’

superior monsters be like? Will they be more intelligent? More capable of genius?”

Visually, this leap to “the invention of a new human being” is even more spectacular than that of “the coming of the matriarchy.” When Rostand speaks of boosting intelligence, we watch—close-up—a model of the brain. As with the close-up of the woman, the brain gently turns around, with light projected its surface. Next, we cut to a semi-transparent model of a torso (no doubt used in medical schools, for pedagogical purposes): its blood vessels, intestines and thorax are visible. The film then offers an x-ray shot of the arms and hands of a ring-bearing musician, playing an old-fashioned string instrument (Fig. 2). It is tempting to think of this musician as performing a “danse macabre,” but in line with the future-oriented drift of the film we may also be reminded of the breakdancing skeleton in the video for Herbie Hancock’s hit *Rockit* (1983).⁶ The scene is remarkable—it brings together transhumanist speculations on enhanced humanity, x-ray photography and baroque music; it also folds the soundtrack into the film, moving it from a non-diegetic to a diegetic register, thereby rendering the relationship

between sound and image tracks unstable. It is difficult for the spectator to master this mix of audio-visual exuberance and wild speculation about a coming, “monstrous” super-race.

The next leap to “the dream of immortality” then comes at the end of a section about the many ways in which sexuality can be manipulated through hormone treatment. Experiments have been particularly successful with salamanders, where embryonic hormone treatment has turned male salamander eggs into female salamanders, which have then reproduced, creating male baby salamanders who are, in Rostand’s formulation, “the sons of two fathers.” This research has proven helpful in the struggle to cure prostate cancer, and provided insights into the lifespan of cells. This sets up the third leap: will research into sexuality help us realise the “old dream of human immortality?” Just as Rostand’s diction emphasises the word “l’immortalité,” the film presents time-lapse photography of marble statues (undoubtedly of “immortal men”) standing by pillars, with shadows moving hastily over them.

The idea of “intergalactic panspermia” ends the film. First, Rostand develops his account of research into (plant and animal) immortality, and the ways in which this relates to cancer research. He explains how we can cultivate and multiply organisms, grow bones and eyes in our laboratories, and graft artificial organisms onto frozen organisms, which can then be brought back to life. In this manner, he arrives at the subject of low temperature. Earlier sections of the film had already touched upon this topic, making passing references to the freezing of organisms, showing Rostand approaching a refrigerator in the corner of his library. Now the film shows icy landscapes, reminiscent of Caspar David Friedrich’s *Das Eismeer* (1823/24), as Rostand speaks of the ways in which ice can disrupt expectations of what comes next both temporally and spatially. For instance, the film shows the French biologist Paul Bécquerel (Fig. 7) receiving frozen organisms from colleagues in faraway countries, preparing them for experiments in his Parisian lab. As Rostand explains in his book *Aux frontières du surhumain* (1962), you can freeze sperm, transport it, and use it to inseminate a female animal far from the male. This is possible with human beings too, and it poses—notes Rostand—a problem for the old judicial principle that if a husband could prove that he had been travelling when his wife became pregnant, he could not be held accountable for this child. To freeze therefore allows us to escape conventional spatial logics. And it similarly allows for a reworking of temporal logics. Taking the same example, frozen sperm can create a genera-

tional mess: the sperm of a male salamander can be used to inseminate his “granddaughter”, thereby making the roles of “partner” and “grandfather” coincide—“granddaughter” and “partner.”

Rostand pushes these disruptions very far, eventually speculating about time and space travel. He argues that frozen organisms escape the death-life dichotomy, and enlighten us about life in the polar regions (where life is paused as winter approaches, and resumes when spring arrives). He then imagines that if we freeze down human microorganisms, and send them to the farthest corners of our galaxy, they may eventually populate faraway stars. This is his “intergalactic panspermia,” the colonisation of space.⁷ The film accompanies these speculations with images that anticipate Ray and Charles Eames’s more famous *Powers of Ten* (1968 [1977]): first we watch the movements of some particles, possibly in a Petri dish; next, through a kind of visual rhyme, we drift—in a point of view-sequence—through a pattern that resembles the molecular landscape, but is in fact a visualisation of outer space. We travel through the stars, into darkness, until the word “Fin” appears. This ending not only takes us beyond the “frontières de l’homme,” it also recalls the opening p.o.v.-shot through the tree-lined countryside road, as we were on our way to meet Rostand. The symmetry nicely communicates that we have gone from sunny, bucolic landscapes, via obscure laboratories, to a galaxy far away.

Naturalizing Surrealism

As is hopefully clear, *Aux frontières de l’homme* is a film anchored in its time. One expression of this historical dimension is the prevalence of a surrealist sensitivity, which I alluded to with the reference to *Documents*, and which will now be explored further. Surrealist notions such as montage, “cadavre exquis” and “diagonal science” may all be used to analyse the film; the film furthermore displays an interest in non-normative sexuality which is also common in surrealism.⁸

The first sentences of *Aux frontières du surhumain* make clear that the surrealist movement is indeed a reference point for Rostand. The biologist opens his book with a quotation from André Breton:

Any discovery that changes the nature or purpose of an object or a phenomenon is a surrealist fact’ (André Breton). If this statement is to be taken literally, it is clear that surrealism pervades all the sciences, and especially the life sciences. The aim of this book is precisely to show how, in



Figure 3. Six-toed toad.

biological laboratories, the tendency to alter the nature and purpose of things sometimes leads to the creation of a new reality – a “surreal.”

In other words, Rostand’s volume (and his film with Vedrès) studies the creative dimension of science. Rostand explains not only what is already happening (we can create bigger and smaller plants and animals, for instance), but he also explains what might happen next.

A key element in surrealist poetics was the montage, and in particular those forms of montage that produce clashes between incongruous elements (resulting in what Peter Bürger termed the “non-organic” work of art).¹⁰ One expression of this tendency was found in Breton’s fascination with Lautréaumont’s “chance meeting on a dissection table of a sewing machine and an umbrella,” a sentence which eventually became something like an emblem of surrealist poetics. The *cadavre exquis* was another expression of this desire to open up the world (and our minds) through chance encounters. In its literary form, this game involves a player who writes a line (or several lines), folds the paper to hide what they have written, before passing it to another player, who continues the passage (the name “exquisite corpse” was produced

in this manner). In its visual form, the game is perhaps better known, most children having tried drawing a head, folding the paper, passing it on to friends, who then draw a torso, legs and feet.

Aux frontières de l'homme does not aim to produce incongruous encounters all the way through, but the discourse of Rostand, with its sudden speculative leaps, does display a *cadavre exquis* logic that is strongly reinforced by the images of Vedrès and Resnais.¹¹ In this manner, biological processes are brought together with musical skeletons, spaceships, and Greek statues, amongst other things. Rostand's fascination with cryogenics similarly fits in here, the cold allowing the scientist to interrupt what we may otherwise consider a natural order, generating unexpected encounters, disturbing expectations about what comes next.

The key point is that Rostand *naturalises* surrealism, suggesting that biology operates in line with the surrealist idea of productive chance encounters. When the film turns to sexual reproduction, for instance, Rostand adopts Lautréamont's famous sentence and speaks about: "the chance meeting of two generative cells." In *Aux frontières du surhumain*, he explains that animals who receive and successfully integrate organs (such as thyroids) from other living creatures are known as "mosaic beings."¹² The film then shows examples of such beings: a frog onto which a third eye has been grafted, a salamander with an extra front leg. These creatures appear as living embodiments of surrealist *cadavres exquis*.¹³ In the same text, he also writes:

It would be easy to draw parallels between these strange productions of the laboratory and certain fantasies of modern art. When an artist like Klee writes that "the world in its current form is perhaps not the only possible world", is he not expressing hesitantly what science asserts more strongly every day?¹⁴

Shortly thereafter he notes that "the big question" is whether man's "'surrealisation' of nature" will also eventually lead to man's "'surrealisation' of himself."¹⁵ For Breton and his allies, surrealism was never an artistic movement, it was always a way of (changing) life; nevertheless, Rostand's surrealist biology operates in a manner more material, more literal than any surrealist might have imagined.

These comparisons between literary, cinematic and biological principles of composition can be associated with the kind of thinking that Roger Caillois termed "diagonal." "Diagonal science" is an important notion in Caillois's late work (but the logic he describes was already at play in his interwar writings). In "After Six Years of a Doubtful Combat," Caillois first

explains that in the sciences, analogies generally have a bad reputation; they are seen as superficial, purely formal, often leading the scientist astray. Next, he concedes that analogies—in particular visual analogies—can result in miscategorisations and bad science: “despite its appearance, the whale is not a fish, nor is the bat a bird.”¹⁶ Nevertheless, true to his surrealist background, Caillois pushes back against disciplinary gate-keepers and the “tacit interdiction against bringing together phenomena which belong to different domains.”¹⁷ For example, although some scientists insist that organic and inorganic matter are radically different fields, Caillois finds good scientific reasons to study the regenerative activity of organic bodies alongside processes of crystallisation. More generally, “the pathways of science always were and should be centrifugal,” and “it would be rash to affirm that [phenomena such as] the radial symmetry of sea urchins, of starfish and of flowers [...] signify nothing and are capable of gratifying only daydreams without being able to inspire rigorous research.”¹⁸ Caillois concludes that “it is time to try the luck of the ‘diagonal sciences,’” those that cut across disciplinary boundaries.¹⁹

Rostand and Vedrès are clearly already doing so. Rostand’s writings are therefore steeped in literary and artistic references, undermining the dichotomy examined in C.P. Snow’s famous 1959 lecture “The Two Cultures” (about the mutual lack of understanding between scientists and “literary intellectuals”, i.e. scholars in the arts and humanities).²⁰ Rostand and Vedrès present us with a world full of movement, where logics of kinship are radically different from what we expect. The universe is malleable, surprising patterns emerge, a “cell is like a cosmos” and the properties of both will be changed if the temperature is lowered. Vedrès’s images show numerous dynamic processes, bringing incongruous elements together through discontinuity editing, finding surprising patterns and formal resemblances, inviting us to see the world as we haven’t yet seen it.

That *Aux frontières de l’homme* experiments with montage and chance encounters is hardly surprising. As is well known, Vedrès’s earlier film, *Paris 1900*, was exactly what the French call “un film de montage”, a found footage film. It was composed with excerpts from approximately 700 newsreels, documentary and fiction films, to which were added a number of still photographs (*Aux frontières de l’homme* similarly shows photographic portraits of some of the scientists mentioned). When Vedrès speaks about *Paris 1900*, she emphasises that a found footage film is less about “reconstructing the real” than it is about the production and creation of the real.²¹ And for Vedrès, creation (creativity) is a matter of montage. Placing filmmaking in



Figure 4. Resnais as a scientist in *Aux frontières de l'homme*

relation to the art of writing (she would soon cease to make films, and instead concentrate on writing), she explains that “the operation known in cinema as “montage” is ultimately what most resembles the work of a writer.”²² Filmmaking is about “selecting” and “combining”, it is about forming a puzzle and less about offering a narrative.

Paris 1900 was Vedrès’s project, but the 24-year-old Alain Resnais was her key collaborator and assistant director. Working on *Paris 1900* and *Aux frontières de l'homme* he picked up the idea of filmmaking as an art of the mosaic, an art of the assemblage, with each individual film clip considered a building block (Godard called Resnais the greatest film editor since Eisenstein). Twenty-eight years later, this approach is still visible in *My American Uncle* (1980)—Resnais’s other biology film, “about the central nervous system,” presenting the research of the biologist Henri Laborit.²³ Resnais briefly considered making this feature as a found footage film, but the prospect of spending months in the archives dissuaded him. Still, the finished film begins and ends with mosaics and puzzles. These figures function self-referentially, highlighting that cinema is an art of building from discrete elements, while also pointing to the view of subjectivity the film constructs: our subjectivity is a puzzle that we assemble and reassemble as we go along. *Paris 1900* and

Aux frontières de l'homme were clearly foundational experiences for Alain Resnais.²⁴

Non-Anthropocentricity in *Aux frontières de l'homme*

Aux frontières de l'homme is not only a surrealist inspired science-film, it also resonates strongly with twenty-first-century discourses about non-anthropocentricity and identity. Different scenes in the film bring to mind diverse writings, such as Timothy Morton (2013) and Timothy Clark's (2015) work on scale shifting, Donna Haraway (2018) on embryology, as well as Ray Kurzweil (2024) on transhumanism. The main questions, considered in this final section, are therefore: how do the surrealist and the non-anthropocentric tendencies combine, and what does it mean for contemporary debates about the relationship between human beings and their environments when such tendencies become almost inextricable?

As we move from surrealist to twenty-first-century aspects of *Aux frontières de l'homme*, it is helpful to compare the film to those of Jean Painlevé. In his excellent *Zoological Surrealism*, James Leo Cahill demonstrates that Painlevé's work has a lot to offer today. In particular, Cahill finds in Painlevé an expression of what he calls "cinema's Copernican vocation":

The shift in attention—from self-regard to nonhuman other, and the ripples or impact that such a perceptual pivot may have on one's self-image—presents in condensed form the main argument of this book: that the films of Jean Painlevé developed a mode of looking and a practice of cinematic encounter that, in turning its attention to animal life and nonhuman worlds, also critically altered conceptions of human life.²⁵

Cahill shows that Painlevé's films are adventures in perception. Painlevé had a keen interest in optical research, and his films clearly communicate his enthusiasm for the ability of the camera to open up the world for us through its nonhuman gaze. Like Painlevé's films, *Aux frontières de l'homme* contains time-lapse and slow-motion sequences and also uses microscope photography. However, Rostand and Vedrès's film cannot compete with Painlevé's more balletic and surprising compositions; its surrealism, as argued here, is largely a matter of montage.²⁶ But does *Aux frontières de l'homme* cease to put the human at the centre of the universe, thereby exemplifying cinema's Copernican vocation?

Whereas Painlevé's films do not generally feature human beings, instead turning to animals (which are sometimes presented in anthropomorphic ways), *Aux frontières de l'homme*—despite its title—gives a more prominent

role to human beings, and therefore cannot be called “anti-anthropocentric” (a term Cahill uses for Painlevé).²⁷ Indeed, some viewers may argue that a film which dreams about superintelligence, human immortality, and a very male colonisation of space (“panspermia”) is anything but Copernican. Nevertheless, the editing of *Aux frontières de l’homme* clearly undoes anthropocentricity. For instance, a section of the film about twins, triplets, and other forms multiplication moves from a shot of hundreds of identical geese to shots of young girl- and boy- quadruplets and quintuplets. Likewise, a section on gender offers images of deer antlers, a cockscomb, a lion’s mane, a man’s beard, a lioness without a mane, and a woman’s breasts. Clearly, the distinction between human and nonhuman animals has no relevance here.

Still, it is crucial to understand that Rostand’s non-anthropocentricity is different from Painlevé’s. Rostand’s version is self-sacrificial. Examining the human being’s ability to modify itself through biological research, Rostand pushes the thought of human self-perfection to the point where we are replaced by something as yet unknown: “le surhumain,” a form of superintelligence. Here the film and the writings of Rostand confound: “le surhumain” appears as necessarily unknowable, and Rostand seems undecided—both excited and confused—at the thought of this new being.

A typical passage from *Peut-on modifier l’homme?* (1956) gives us a flavour of Rostand’s ambivalent *transhumanism*:

...what interests, what fascinates us is the question whether [man] is likely to be able to increase the gap between him and primitive man, whether he can hope to make himself more intelligent, more clever, more sensitive, more disposed to solidarity and altruism, in a word, more human. [Biology] suggests to us various dreams, which some people will call nightmares. These I will review, but not without the precaution of warning my readers that I do not necessarily approve of the use of all the procedures which science places at our service.²⁸

This passage shifts quickly from *fascination* with the idea of a new improved man (Rostand frequently argues that we have “a duty” to create this new being), to an acknowledgement of the possibly *nightmarish* dimension of such experiments. Rostand then moves to a semi-neutral position (“I do not necessarily approve”) whose exact parameters are difficult to determine (“not necessarily,” “not... all”).²⁹ After these ambiguous statements, Rostand nevertheless emerges as an advocate for transhumanist experimentation: “I shall take it as a postulate that man must aim at surpassing himself, at drawing from himself something better than himself.”³⁰ The argument for this belief

in what we might call “human self-replacement work” has to do with his faith in science. Borrowing an expression from Charles Richet, Rostand argues that science is “the worship of truth for its own sake”.³¹ We must therefore love science, and pursue what is scientifically possible, even when this runs counter to the interests of our species. More than this, we must learn to love this sacrifice: real scientists “love [scientific truth] so much that they find honour, and almost find delight, in proclaiming when it goes against them.”³² In this manner, Rostand anticipates contemporary transhumanism, where similar ideas about our moral obligation to engage in human enhancement work can also be found. Writing about how we will soon “merg[e] with superintelligent AI,” Ray Kurzweil for instance stresses that “We have a moral imperative to realize this promise of new technologies while mitigating the peril.”³³ We must not stand in the way of what he calls “the rising tide,” “information technology facilitat[ing] its own advancement.”³⁴

But how do Vedrès’s and Resnais’s images relate to Rostand’s confusing and worrying verbal formulations, in both the film and his writings? As we have seen, the film accompanies Rostand’s discourse by emphasising its speculative dimension. At each of the four speculative leaps, Vedrès and Resnais go all in: selecting images that seem outlandish, making it impossible for spectators to miss the fact that Rostand is embracing a surrealist dimension of science. These leaps frequently contain slow movements – the woman gently turning her head; the model brain rotating; the camera panning along the statutes, with shadows cast over them—all of which add mystery and eeriness to the scenes. These dramatizations do not operate in isolation as many other aesthetic decisions trouble the didacticism of the commentary track. Consider the depiction of workplaces: when showing laboratories, greenhouses, Petri dishes, and test tube-landscapes, the *mise-en-scène* tends towards mystification. There are carefully lit low-angle shots of jars containing modified organisms (Fig. 6); and many other shots with modest lightning infuse the film with a film noir-like atmosphere. This is further strengthened by a mix of scientists in white lab coats (one of them played by Resnais (Fig. 4)), and men in three-piece suits, wearing hats, opening mysterious packages, brandishing giant syringes (Fig. 7). At one point, Rostand describes an experiment, but rather than filming the procedure directly, Vedrès offers a form of disembodied puppetry, showing the shadows of hands manipulating tools and apparatuses. Add to this the violence of certain images: toads with extra toes and ears (Fig. 3), a couple of conjoined piglet twins in a jar of formaldehyde (Fig. 5), conjoined human babies—other animals literally



Figure 5. Conjoined piglet twins, seen from the back; were they created at the workstation in the background?

pinned up for examination, almost crucified.

It is tempting to push this reading so hard that all ambiguity disappears. In other words, one might contend that Vedrès and Resnais undermine the transhumanist speculations of Rostand, bringing us back on ethically safe ground and allowing us to examine from a distance the popular scientist's flirtation with eugenics. However, such a reassuring reading is difficult to uphold. This was the second time that Vedrès and Rostand collaborated: would Vedrès renew this collaboration to criticise Rostand? If so, would she share the credits with him? It is also worth noting that in the various interviews in which Resnais looked back on the film, he did so with fondness, never expressing any desire to distance himself from Rostand or the film. Perhaps this is unsurprising: Rostand was far from a marginal figure in French intellectual life. He may not have been a leading scientist, but he was a highly educated science journalist with a platform like almost no other in France. This suggests something about how relatively mainstream a discourse with a eugenicist flavour could be even after World War Two. But of course, transhumanist discourses continue to exist today, both in biological and in technological versions.³⁵



Figure 6. ‘carefully lit low-angle shots of jars containing manipulated organisms..’

Aux frontières de l'homme thereby occupies a position that is unlikely to appeal to most contemporary viewers. On the one hand, those of us who are sympathetic to the criticism of anthropocentricity will be disturbed by the presence of transhumanist tendencies: the fascination with superintelligence, and the ambiguous self-sacrificial logic which Rostand's texts present as a moral obligation. Although it is true that Rostand describes some of the biological innovations as “troubling”, his excitement makes it difficult for the viewer to get a clear sense of what to embrace and what to reject.³⁶ It is, of course, possible to be clearer. For instance, Painlevé and Rostand offer markedly different responses to the Nobel-prize winning physiologist Alexis Carrel's promotion of eugenics during the interwar period: Painlevé wrote a scathing critique of Carrel's bestseller *L'homme cet inconnu* at the time of its publication (1935), whereas Rostand continued to cite Carrel (including twice in *Aux frontières de l'homme*) without ever distancing himself from his eugenics.³⁷ On the other hand, contemporary transhumanists are likely to find the presence of surrealist tendencies (such as the emphasis on ‘chance encounters’) obtrusive and entirely inappropriate. Indeed, for Kurzweil, the problem with biological evolution lies precisely in the role it gives to chance.



Figure 7. The biologist Paul Becquérél: hat, jacket and oversized syringe

As he provocatively writes: “Biological life is suboptimal because evolution is a collection of random processes optimized by natural selection. [...] By contrast, applying intelligence (human or artificial) to biology will allow us to systematically explore the full range of genetic possibilities in search of those traits that are optimal.”³⁸

Rather than the reassuring idea of a film “undermining” the biological discourse, it therefore seems appropriate to say that Vedrès and Resnais are riding the contradictions of Rostand’s transhumanist surrealism. The film charms and worries, but it does not condemn. Viewers wishing for clearer distinctions between transhumanism and surrealist non-anthropocentricity will prefer Painlevé’s work, but precisely because of its ambiguities, in particular those that blur the lines between surrealism, non-anthropocentricity and transhumanism, these viewers may still find that *Aux frontières de l’homme* constitutes a rich resource for thinking about the plasticity of life in all its complexities.

Coda

Anticipating many contemporary themes, it is not surprising that Rostand and Vedrès's film resembles a number of recent films, and few more so than Lucille Hadžihalilović's *Evolution* (2015). Hadžihalilović's film is a work of fiction, thus some of the ethical debates surrounding it are different,³⁹ but it shares with *Aux frontières de l'homme* a fascination with surrealist biology, gender (more specifically matriarchy), and transhumanist experimentation—all enveloped in an aura of mystique. More than this, Hadžihalilović's interests seem to lie in the intersection of embryology and film, with *Evolution* offering a filmic exploration of Caillois's diagonal science. The director composes her film with specific forms (most notably the star shape) that flow over the characters, animals (sea urchins, again), and settings, providing the film with a kind of patterned coherence that largely replaces narrative cohesion, while still allowing forms to mutate. Hadžihalilović's film embraces evolution as a messy process, whereas Rostand's discourse manifests a weak desire for direction (as opposed to Kurzweil's "strong" desire) that Vedrès's image track does not entirely satisfy. Both films are exceptionally adept at playing with the contradictions of non-anthropocentric, transhuman surrealism, causing the spectator to hesitate before risking an answer to the question "what next?"⁴⁰

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NOTES

1. Jean Rostand, *Aux frontières du surhumain* (10/18, 1973) 67.
2. *Ibid.*, 68.
3. I write "finally," but since Rostand frequently repeated and recycled, there is little doubt that the ideas mentioned here can also be found in many of his other texts.
4. Anonymous, *Monthly Film Bulletin* 23, NO. 264, (British Film Institute, 1956), 35.
5. Edited by Georges Bataille, *Documents* (1929-30) was a key journal for what is sometimes called "dissident surrealism" (as opposed to André Breton's surrealism). It featured photography by artists such as Eli Lotar and Jaques-André Boiffard, some of which springs to mind when watching *Aux frontières de l'homme*. From Rostand and Vedrès's film, I have chosen a still of the sea urchin; this is an important animal in the surrealist bestiary, appearing for instance in *Un chien andalou/An Andalusian Dog*

(1929), in the work of Lotar (1931), and in that of Roger Caillois.

6. On the “danse macabre” in Painlevé’s surrealist science film *Caprella and Pantopoda* (1930) and Walt Disney’s *Skeleton Dance* (1929), see James Leo Cahill’s *Zoological Surrealism: the Nonhuman Cinema of Jean Painlevé* (University of Minnesota Press, 2019): 102-07.

7. Rostand, *Aux frontières du surhumain*, 68. The notion of panspermia, first found in the work of Anaxagoras (500-428 BC), refers to the idea that astral bodies, including planets, hosts seeds of life, that may travel through space. Whereas Anaxagoras’s panspermia allowed for multidirectional cosmic pollination, Rostand’s travelling sperm (or seeds) depart from planet earth.

8. I will not be able to engage with Rostand’s reflections on gender and sexuality, but *Aux frontières du surhumain* devotes long passages to the multiple ways in which male and female chromosomes can combine in fruit flies and human beings (XY, XX, XO, XXX, XXY, XYY, XXY...). The topic of sexuality and gender is prevalent already in the first five minutes of the film which culminate in the speculations about a matriarchal society. It is precisely these five minutes that have been subtitled into English and uploaded to YouTube, giving the impression that *Aux frontières de l’homme* is a feminist film. Although this may not be accurate, it is worth noting that in 1971 Rostand was among the co-founders of the French feminist organisation “Choisir, la cause des femmes”, alongside Gisèle Halimi, Simone de Beauvoir, Christiane Rochefort and Jacques Monod.

9. Rostand, *Aux frontières du surhumain*, 7.

10. See Peter Bürger, *Theory of the Avant-garde* (University of Minnesota Press, 1984). Whereas Bürger’s idea of what is organic (i.e. harmonious) and non-organic comes from German Romanticism, *Aux frontières de l’homme* shows how non-organic (i.e. incongruous) the organic world can be.

11. I include Resnais here, assuming that (much like in *Paris 1900*) he played a role in selecting the images lifted from other films (the spaceship, the woman looking into the distance, the musical skeleton...).

12. Rostand, *Aux frontières du surhumain*, 47.

13. Rostand also juxtaposes the mosaic being with “des êtres-chimères” (chimeric beings or simply chimera (47)). In genetics, this latter notion is defined as a single organism composed of cells with more than one distinct genotype.

14. Rostand, *Aux frontières du surhumain*, 27-28.

15. *Ibid.*, 33.

16. Roger Caillois, “After Six Years of a Doubtful Combat,” *Diogenes* 26 (Summer 1959): 1.

17. *Ibid.*, 2.

18. *Ibid.*, 4.

19. Caillois, “After Six Years of a Doubtful Combat,” 6.

20. C.P. Snow, *The Two Cultures* (Cambridge University Press, 1998), 4.

21. “When you make a film, a found footage film, and you are constantly dealing with history without claiming or having the ability to reconstruct it – the work of selection and representation is therefore much more akin to that of literary fiction than to that of historical compilation.” Nicole Vedrès, *Paris 1900* [1947], Doriane Films,

2017. DVD booklet, 6.

22. Ibid., 6.

23. Lynn A. Higgins, *Alain Resnais Interviews* (University Press of Mississippi, 2021), 77.

24. Not only were these experiences foundational for Resnais; speaking of Vedrès, Resnais's friend and 1950s collaborator, Chris Marker went as far as to say: "I owe her everything" (cited in the DVD booklet accompanying Vedrès, *Paris 1900*, 31). That Resnais must be understood in relation to surrealism is the central thesis of Robert Benayoun's classic study *Alain Resnais, arpenteur de l'imaginaire* (Ramsay, 2008).

25. James Leo Cahill, *Zoological Surrealism: the Nonhuman Cinema of Jean Painlevé* (University of Minnesota Press, 2019), 3.

26. This difference between Painlevé and Vedrès is not absolute. Painlevé's *Le Vampire* (1945), for instance, anticipates *Aux frontières de l'homme*. This fascinating, but also rather atypical film in Painlevé's filmography, combines footage of a vampire bat sucking blood from a Guinea pig with images from Murnau's *Nosferatu* (1922), maps of Europe, and a soundtrack with one of Duke Ellington's most political compositions (*Black and Tan Fantasy*), all to deliver a critique of Hitler's invasion of other European countries. As we shall see shortly, Rostand's politics and ethics are much more confusing and worrying than Painlevé's.

27. Cahill, *Zoological Surrealism*, 16.

28. Jean Rostand, *Can We Modify Man?* (Secker & Warburg, 1956), 78.

29. In another typically confusing passage from the same volume, he remarks: "Until human selection has been tried, nobody has the right to assign an upper limit to man. That does not, indeed, mean that such selection ought to be put into practice. But at least it is essential to recognise honestly what advantages it might bring to mankind, and to know, if we reject it, what we are rejecting with it" (90).

30. Rostand, *Can We Modify Man?*, 98.

31. Richet was not only a Nobel Prize winning physiologist, he was also the president of the French Eugenics Society from 1920-26.

32. Rostand, *Can We Modify Man?*, 104.

33. Ray Kurzweil, *The Singularity is Nearer: When We Merge with AI* (London: Bodley Head, 2024), 109, 285.

34. Ibid., 194.

35. James Lovelock's posthumous book, *Novacene*, is an example of this second tendency. Lovelock does not entertain the idea of biological modification of humans, but argues that AI will eventually evolve beyond human control, and that "cyborgs" (defined as "intelligent electronic beings") will take over. These cyborgs will be benevolent, with their ambitions and goals shaped by the need to comply with the demands of Gaia. What Lovelock shares with Rostand is the belief that it is the role of human beings to prepare for the creatures (for the "hyperintelligence") that will replace us. (On transhumanism and eugenics, see also Laurent Alexandre and Jean-Michel Besnier's *Do Robots Make Love?: From AI to Immortality* (Cassell, 2018). The transhumanist Alexandre here repeatedly argues that eugenics already is a social fact: "We have jumped on the eugenics bandwagon without realizing it. Down's syndrome is disappearing before our eyes; in the UK about 90 percent of pregnancies with a prenatal diagnosis of Down's

syndrome are terminated, in France it is about 97 percent, and in the US the figure is estimated to be 67-85 percent”, *Do Robots Make Love?*, 17).

36. In his history of French transhumanism, Alexandre Moatti sums up Rostand’s position in the following terms: “Rostand was, from 1932 to 1972, the unrivalled champion of the idea of the modification of human beings by human beings, whether through eugenic selection or chromosomal manipulation – the key for him being the improvement of the average human gene. Both a whistleblower and a prophet, always balancing on the edge of opposing positions, with dangers on one side and exaltation on the other, he nevertheless largely contributed to the latter.’ See Moatti’s *Aux racines du transhumanisme, France 1930-80* (Odile Jacob, 2018), 130.

37. Carrel was (among other things) a highly regarded scientist, the 1912 winner of the Nobel Prize in medicine, and a eugenicist in favour of the euthanasia of criminals. In 1979 (*sic!*) a lunar crater was named after him.

38. Kurzweil, *The Singularity is Nearer*, 189.

39. Elsewhere I have argued for the importance of allowing fiction films to explore aspects of the human psyche that we find problematic in everyday life: there should be different ethical norms for life inside and outside the movie theatre. In that volume, I wrote only about fiction films. I believe documentary film, and the many films that blend fiction and documentary, call for a separate (although not unrelated) analysis. See Nikolaj Lübecker, *The Feel-Bad Film* (Edinburgh University Press, 2015).

40. Many thanks Jack Nunn and Jennifer Oliver for devoting time to a discussion of *Aux frontières de l’homme*.