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Transindustrial Bridges
Reviving Lost Innovations for a Sustainable Future

Introduction

In the realm of technological evolution, the concept of transindustriality emerges as a pivotal lens through which we can re-examine the trajectory of renewable energy technologies and low-tech, retrotech approaches. This study delves into the rich tapestry of innovations, particularly those that have been marginalised or overlooked in the historical progression from fossil fuel reliance to a more sustainable energy paradigm. By exploring these neglected technologies, we not only unearth potential solutions for contemporary ecological challenges, but also engage in a critical reflection on the temporal shifts and circulations of technology that define transindustriality.

Transindustriality, in its essence, represents the fluid movement and adaptation of technologies across different historical periods, transcending the boundaries of time and industry. This concept invites us to consider how innovations, especially in the field of renewable energy and low-tech methodologies, have traversed these temporal divides, often resurfacing with renewed relevance in different contexts. In this light, our study serves as both an exploration and a question: how do these historical innovations inform our understanding of transindustriality, and in what ways can their temporal journey shed light on the potential for sustainable technological development in our current era?

The modern era, characterised by a surge in inventions using fossil fuels, has significantly shaped our technological landscape. From the steam engines of the 18th and 19th centuries to the digital advancements of the 21st century, each period of technological creativity has left a legacy of innovations. However, a closer examination reveals a striking reality: not all inventions have been fully embraced or further developed. Many, brimming with potential to address today's pressing energy sustainability challenges, remain in the overlooked corners of history. This study aims to spotlight these neglected gems, advocating for their rejuvenation and integration into our modern age, where the demand for sustainable solutions has never been more urgent.

In doing so, we engage with the core dimensions of transindustriality: the survival of technologies across historical periods, the cohabitation of technologies from different eras, and the transfer of technologies across industries. This exploration is not merely retrospective but is imbued with a speculative vision, pondering the potential trajectories and applications of these technologies in a world increasingly conscious of its ecological footprint. By revisiting these past innovations through the lens of transindustriality, we not only pay homage to the ingenuity of our predecessors but also pave the way for a more sustainable and interconnected technological future.

Historical Context

In the historical narrative of energy acquisition, the sun and wind have been the quintessential elements, their incessant and abundant presence designating them as timeless but still relevant sources. However, this relationship underwent a significant change during the period of modernity, particularly in the context of the rise of coal and steam technologies. In the midst of this industrial transition, solar energy retained its role as a crucial, if often underestimated, energy resource. In this context, the contributions of Augustin Mouchot in the 19th century are particularly noteworthy. Mouchot was a pioneer who harnessed the potential of solar energy at a time dominated by industrial progress. His innovative efforts led to the creation of mechanisms that efficiently converted solar heat into mechanical energy. This method, revolutionary for its time, represented a pivotal moment in the application of solar energy, linking its ancient use to the possibilities it offered in the modern steam industry.

In examining Mouchot's work, the concepts of "low tech" and "retrotech" are instrumental.[1] "Low tech", refers to technologies that are simple, accessible, and sustainable, focusing on the use of minimal resources and the reduction of environmental impact. These technologies are characterised by their ease of use, repair, and recycling, standing in contrast to more complex and resource-intensive high-tech solutions. "Retrotech", on the other hand, involves the inventory and evaluation of existing technological resources—ideas, concepts, or ecological and resilient patents—and their updating, possibly with contemporary technologies such as digital tools. This type of innovation, known as "retrotech", is distinguished as "frugal innovation". It aims to meet needs using minimal means, unlike low-

1 Cédric Carles, Thomas Ortiz, Eric Dussert, Loïc Rogard, *Retrotech and Lowtech — how forgotten patents can shake the future*, (Paleo-Energy Press, 2021).

tech solutions. Mouchot's approach in harnessing solar energy, employing straightforward mechanical processes, exemplifies the essence of low tech, while his innovative reinterpretation of solar technology aligns with the principles of retrotech, demonstrating a frugal yet effective use of existing knowledge and resources.

Concurrently, the whispers of the wind unveiled their secrets to those attuned to them. As depicted in "Retrofutur", wind mechanisms have a history stretching far beyond our modern turbines.[2] From the rudimentary windmills of ancient civilisations to the intricate designs of the 1980s, the wind has consistently mirrored human ingenuity. Yet, what we recognise today as wind turbines represents but a fraction of the myriad designs and concepts from the past. A study of the technical history of wind machines, with a transindustrial Retrotech perspective, would enable us to enhance the value of medium-power wind turbines producing electricity or mechanical services for decentralised communities.

Among these historical accounts, another beacon of innovation stands out: Alexander Graham Bell's photophone in 1880. Conceived as a means to transmit voice using sunlight, it epitomised the zenith of cross-industry innovation, merging light and sound in a technological symphony.

Collectively, these past narratives convey a pivotal message: the solutions to our present-day dilemmas might well lie within historical annals, awaiting rediscovery and reimagining for our current world.

Marginalised Innovations

Throughout history, we are often amazed by the brilliance of past innovations which, for various reasons, did not get the chance to be properly acknowledged. Consider, for instance, the fascinating case of Jean-Luc Perrier. Born in 1944 in Angers, this pioneer of concentrated solar technologies and hydrogen developed a 50kW solar concentrator, a hydrogen-powered vehicle, and a solar dwelling. His heliotechnical complex, established as early as 1971, was divided into three main areas: the solar concentrator, the hydrogen vehicle, and the solar home. These projects were realised through his own financial means, without external assistance, and often in solitude. He aimed to raise awareness among authorities and the industrial sector about the energy alternatives of his time. However, despite his significant contributions and an acclaimed book,[3] contemporary society remains under the grip of fossil fuels, and Perrier's approach remains largely unknown.

Our studies "Retrotech & Lowtech" and "Retrofutur" illuminate a plethora of similar innovations, each bearing the imprint of visionary foresight and sustainable aspirations. These include wind turbines, once a common feature in our landscapes, characterised by their distinctive designs and functionality. Solar systems, too, feature prominently, reflecting early endeavours to harness the sun's power for a future orientated towards renewable energy.

These innovations represent pivotal shifts in energy usage and the social governance of renewable resources. The energy usage patterns they propose challenge the conventional reliance on non-renewable energy sources, advocating for a transition to more sustainable, environmentally friendly methods. This shift is not just about the technology itself, but also about reimagining by the study of the past our relationship with energy — how it is produced, consumed, and shared within communities. One question remains: why were these innovations forgotten?

Some of these technologies, revolutionary for their time, were perhaps too avant-garde, out of sync with the standards of the era, or lacked the necessary infrastructure for their deployment. Others might have been overshadowed by more profitable or better-promoted solutions.

Nevertheless, the true essence of these inventions was not in their direct impact, but in their underlying vision. They offered divergent alternatives from the prevailing trend, sketching a universe where energy would be clean, abundant, and in harmony with nature. The resonant echoes of these neglected innovations implore us to adopt a transindustrial perspective, one that not only revisits the past but also critically evaluates it in the context of our current ecological imperatives. This transindustrial focus, by its very nature, compels us to confront historical blind spots in technological development, recognising that within these overlooked narratives lie potential keys to a more sustainable future. It is not merely a matter of rediscovering what was once forgotten, but of recontextualising these innovations within our present-day ecological and technological landscape.

In this vein, a transindustrial approach necessitates a dual awareness: firstly, of the historical trajectory of technological development, acknowledging the phases and transitions that have led to our current state; and secondly, of the pressing ecological injunction that demands a reevaluation of our technological choices and priorities. This perspective fosters a critical understanding of how past technologies, often sidelined in the wake of new developments, can offer viable and sustainable alternatives to contemporary challenges.

By integrating the transindustrial lens into our study, we not only pay homage to the ingenuity of our predecessors but also engage in a proactive dialogue with history, extracting lessons and insights that are vital for our ecological future. This approach underscores the importance of a holistic understanding of technological evolution, one that transcends linear narratives and embraces the complexity and interconnectedness of our industrial heritage. Thus, the imperative to revisit and value the paths left behind becomes not just a historical exercise, but a crucial step towards forging an eco-responsible future, in-

2 Cédric Carles, Philippe Bruyerre, Loïc Rogard, *Rétrofutur : une autre histoire des machines à vent*, (Paleo-Energy Press, 2022).

3 Jean-Luc Perrier, *Énergie solaire et hydrogène : état actuel des applications*, (Éditions techniques et scientifiques françaises, 1980).

formed by the wisdom of the past and the needs of the present.

Barriers and Factors of Omission

The evolution of innovation doesn't always follow a straightforward path. Even the most transformative advancements face a complex set of challenges and setbacks before they can deeply influence society. The reasons for the omission of many past innovations are varied and intertwined.

In the landscape of technological innovation, particularly in the realm of renewable energies, the role of economic factors is often a decisive one. The progression from an idea to a widely adopted technology is not just a journey of invention and development but also one of securing necessary financial support. This aspect becomes even more pronounced in scenarios where innovations, despite their technical merit, do not attract substantial external investment. The case of Jean-Luc Perrier's hydrogen car is illustrative of this dynamic.

Perrier's project, emerging during a period marked by economic instability due to the oil crisis, was notable for its self-financed nature. The oil crisis period presented a paradoxical backdrop: while it underscored the need for alternative energy sources, it simultaneously engendered a climate of financial uncertainty. Investors, operating within this context, often exhibited reluctance to allocate funds towards technologies that deviated markedly from established norms.

Despite the inherent challenges of the economic climate, Perrier pursued the development of his hydrogen car through personal funding. This approach, while demonstrating remarkable commitment and belief in the potential of his innovation, also highlighted a significant barrier in the broader landscape of technological advancement: the difficulty of attracting serious investors for technologies that significantly deviate from established norms or present radical new paradigms.

Although Perrier's innovation garnered interest from the media and public authorities, it failed to secure the investment needed for widespread dissemination and adoption. This lack of serious investor engagement underscores a critical aspect of the economic dimension in technological innovation. It points to the cautious nature of investment in new technologies, especially in fields that challenge or seek to replace existing energy paradigms. Perrier's experience serves as a poignant reminder of the complexities and challenges innovators face in not only developing new technologies but also in navigating the economic ecosystems necessary for their success and broader societal impact.

One of the major dynamics hindering the consistent development of renewable innovations is the volatility of prices and availability of fossil fuels, especially oil and coal. Historically, during times of crisis, when these raw materials become scarce or expensive, interest in renewable alternatives significantly increased. These moments of economic tension and energy uncertainty promote the emergence and adoption of green innovations, which then appear as viable and sustainable solutions compared to the dependence on non-renewable energies. However, this dynamic reverses as soon as oil and coal become abundant and economically attractive again. Renewable initiatives, which had gained ground during the crisis, are often sidelined or even completely abandoned in favour of these cheap fossil fuel sources. This cyclicality, dictated by market whims, hampers the steady progress and widespread adoption of renewable energies, making their development precarious and dependent on economic fluctuations rather than a long-term vision focused on sustainability.

Sociopolitical constraints also play a role. In an era dominated by coal, oil, and gas, renewable alternatives might have seemed unconventional or even threatening to established sectors. Lobbying efforts, the spread of misinformation, and even patent cancellations could hinder the evolution of innovative technologies.

Moreover, technological constraints specific to each era could make some innovations premature. Bell's photophone, although a marvel of its time, lacked the components and sophisticated electronics necessary for its commercialisation.

Sociocultural perceptions also have an influence. The fascination with the "new" and the "contemporary" can sometimes overshadow the relevance of what has been tried and tested. Earlier advancements, despite their effectiveness, can be seen as outdated or redundant in the face of emerging technologies.

Lastly, documentation and knowledge dissemination are crucial. Innovations that are poorly documented, not patented, or insufficiently publicised risk fading into obscurity, their potential unexplored.

Understanding these barriers is essential. By analysing the reasons for past omissions, we might discern the strategy to ensure that future innovations don't meet a similar fate.

Rethinking the Notion of Progress

The traditional concept of progress, often seen as a linear trajectory, tends to favour the contemporary over the ancestral, and the spectacular over the essential. This narrow view risks overlooking treasures of knowledge accumulated over time.

"Retrotech & Lowtech" and "Retrofutur" challenge this conventional understanding. Our essays advocate for a more cyclical and holistic view of progress, where yesterday's advancements can enrich and complement today's. The example of RegenBox is particularly telling in this regard.[4] Inspired by a 1980s patent from Karl Kordesh, co-creator of the alkaline battery, this project is based on the ability to recharge initially non-rechargeable batteries through micro-electric pulses. Although this innovation was overlooked in its time, Atelier 21, in 2016, recognised its potential to minimise battery consumption. They revived the technology with RegenBox, a device that regenerates alkaline

4 https://regenbox.org

batteries. Initially supported by a crowdfunding campaign, the project gained such traction that it led to the foundation of RegenFab in 2021. The core ambition of RegenBox is to significantly reduce waste related to batteries by extending their lifespan. Even though it draws from 1980s technology, this initiative perfectly addresses current ecological challenges, showing how past innovations can be adapted to contemporary issues.

Furthermore, knowledge management, especially through patents and exclusive technologies, has sometimes limited the free dissemination of ideas. While intellectual property rights are crucial for stimulating innovation, an excessive focus can hinder the societal benefits of shared technology. It Is imperative to strike a balance, ensuring both the compensation of inventors and the promotion of democratic access to knowledge.

This renewed vision of progress encourages us to revisit our archives, question accepted notions, and value often overlooked contributions. By adopting this approach, we honour the visionaries of the past while equipping ourselves with relevant tools to face current and future challenges.

Epilogue / Conclusion

In the face of a future filled with uncertainties, the lessons from our industrial heritage are of paramount importance. The overlooked blueprints of many past visionaries hold the key to transforming our energy landscape, offering sustainable solutions in line with today's ecological and sobriety demands.

However, this revival goes beyond mere technology. It beckons us to reshape our paradigm, shifting from a linear logic to a cyclical approach, from compartmentalised knowledge to shared understanding, and from raw innovation to genuinely meaningful development. While the challenges we confront are immense, the accumulated wisdom of our predecessors is equally monumental.

In the pursuit of understanding and applying the concept of transindustriality, our research into the overlooked advancements in renewable energy technologies, low-tech, and retrotech approaches becomes not just an academic endeavour but a necessary step towards a sustainable future. The potential of these neglected innovations, when harnessed and integrated into our contemporary context, offers more than just technological advancement; it represents a paradigm shift towards an environmentally respectful future. This process, however, requires more than individual effort; it demands a collective commitment to reevaluate and repurpose the wisdom of the past. This is why our research is crowdsourced as a participative citizen science project.[5]

Reflecting on transindustriality through the lens of our research, we recognise that this concept transcends mere technological evolution. It embodies the fluidity and adaptability of technologies across time and space, challenging us to rethink the linear progression of industrial development. Our work advocates for a transindustrial perspective that values the interconnectedness of different historical periods and the potential of technologies to be reborn with new relevance in our current era. This approach is not only advocative but also speculative, as it encourages us to imagine a future where the integration of past innovations plays a crucial role in addressing contemporary ecological challenges.

In this light, transindustriality becomes a guiding principle for our research, urging us to explore the intersections of historical technological trajectories and their implications for today's world. It invites us to consider how the revival and adaptation of past innovations can contribute to a more sustainable and equitable society. By allowing the lights of yesterday to illuminate the path forward, we enable a dialogue between generations, fostering a future that is informed by the lessons of the past and driven by the aspirations of future generations.

In conclusion, our journey through the realms of renewable energy, low-tech, and retrotech is more than a retrospective exploration; it is a proactive engagement with the concept of transindustriality. It is a commitment to re-envision progress, not as a linear path but as a cyclical process of learning, adapting, and evolving. By embracing this perspective, we not only honour the ingenuity of our predecessors but also lay the groundwork for a future that respects and harmonises with the natural world.

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Cédric Carles, a Franco-Swiss designer and researcher, is the founder of the think tank *Atelier21*. His projects and actions are part of a global reflection on urgent climate and energy issues. His approach, both experimental and academic, combines art, design, new technologies, social innovation, and sustainable development. He is the founder of the educational project *Texader* in Switzerland, the *SolarSoundSystem*, and the participatory research project *Paleo-energetic*.

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