



## Social Sciences

# Exchanged time in shared isolation: circulation of debt in Antarctica

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### Abstract

On an Antarctic research station, money is rendered useless, and essential material goods are imported from participating countries. Recognizing time as a valuable resource and acknowledging the existence of gift-giving practices, this article investigates the economic exchanges among members of an Antarctic expedition. Drawing on a 15 month ethnographic study conducted at the French Dumont d'Urville Station from November 2019 to January 2021, I analyse the gift of time and the exchange of services among the 24 members of the 70th expedition to Adélie Land, isolated for 8 months by the winter pack ice. The study presents an anthropological perspective on overwinterers, a population predominantly studied within the field of psychology, and examines the extent to which mutual aid and volunteering, which are often overlooked, shape interpersonal relationships and group dynamics. By exploring the ethnography of Antarctic time in relation to work and delineating various categories of service exchanges, we gain insights into individual motivations, causes, consequences and sanctions within the broader context of social relationships. I propose the hypothesis that the perpetual cycle of indebtedness among overwinterers plays a significant role in maintaining the smooth operation of an Antarctic station and fostering social balance within a winter crew.

**Key words:** Dumont d'Urville Station, ethnography fieldwork, exchanges, time, volunteering, winter-over

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### Introduction

Time holds great importance in Antarctica. Mario Marret's book *Sept hommes chez les pingouins* (*Seven men among the penguins*) captures the fast-paced nature of summer, contrasting with the monotonous rhythm of winter (Marret 1954). Ethnologist Alain Baquier describes how overwinterers diligently track time by consulting their diaries daily, while some individuals struggle to maintain awareness of days, birthdays and dates (Baquier 2013, p. 74). Recent studies explore the impact of seasonal variations and isolation on Antarctic personnel's time perception (Tortello *et al.* 2020). Research extends to other aspects of Antarctic life such as adaptation processes, performance and teamwork (Kuwabara *et al.* 2021, Schmutz 2022). In this unique environment where time and work are intricately interwoven, research on psychosocial dimensions related to isolation and extreme conditions serves as a valuable analogue to studies on prolonged space missions for over 50 years (Suedfeld & Weiss 2000).

However, human behaviour research in Antarctica has primarily been conducted within the field of psychology (Palinkas & Gunderson 1988, Schweitzer 2017), and the social sciences are under-represented. Anthropological studies are rare and recent (Salazar 2013, O'Reilly 2017), and long-term ethnographies are almost non-existent, primarily due to the recent historical

presence of human activities on the continent and challenges in obtaining access to this remote region. The short operational window, typically limited to a few weeks in the summer, hinders extensive ethnographic fieldwork. Despite these constraints, anthropology, as emphasized by Peter Schweitzer (2017), offers a holistic perspective on polar worlds, including Antarctica. Ethnographic studies within this anthropological framework document cultural practices, social structures and symbolic meanings in the daily lives of polar inhabitants. This in-depth comprehension is essential for understanding how individuals cope with isolation, extreme conditions and the demanding nature of their tasks. This article relies on ethnographic methods with the aim of examining Antarctic work through the lens of time and temporality.

An Antarctic year is divided into two main seasons. On the Adélie Land coast (Fig. 1) - the study site - the warm season lasts from November to February, with temperatures ranging from -10°C to 5°C. During the 'summer campaign', ~80 stations accommodate 5000 individuals, including scientists, technicians, polar institution personnel, artists, journalists and so on (O'Reilly 2017). As winter approaches, the station population decreases to 1000 and the vast pack ice isolates the overwinterers. As one of the station's biologists, I felt this difference of pace. The animals, except for the emperor penguin, leave for warmer waters. Temperatures drop, time slows down and darkness gradually envelops the region after a brief period of balanced nights and days. Working hours become more flexible, days less hectic, and winterers establish individual and collective routines.

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**Figure 1.** Location of Adélie Land on a map of Antarctica. Source: Susie Pottier.

On the French Dumont d'Urville Station (DDU), the only research station in Adélie Land, meals are served at fixed times, certain evenings of the week are dedicated to movies or games and the members of the crew have an afternoon snack at 16h00 on Sundays. Daily life at the station is punctuated by events and celebrations that recur from year to year: the 'systematic medical check-up' every 3 months (*la Visite médicale systématique*, also called VMS), the rescue team training<sup>1</sup> once a month during the winter, the Midwinter<sup>2</sup> at the end of June or the Winter International Film Festival of Antarctica (WIFFA) after the Midwinter are a few examples. Winters follow each other in a defined time cycle, although the perception of the passage of time varies according to the individual, and each winter-over is experienced differently by each person. When the summer returns, the former overwinterers - the 'outgoing' - prepare their successors for the tasks that await them while anticipating their departure and the return to 'civilization'. One cycle ends, another begins.

This initial overview of Antarctic time highlights its cyclical nature and the seasonal variations between summer and winter. While these variations may not be as visually striking as the transformations observed in the Inuit habitats analysed by Marcel Mauss (2013 [1905]), they show the dynamics of demographics, spatial occupation, work and social interactions of a station.

<sup>1</sup>The station has three volunteer wintering teams: the fire brigade, the medical team and the rescue team.

<sup>2</sup>This is the time of year when the days are shortest (during the week of 21 June), providing the opportunity for festivities celebrated by all the Antarctic and sub-Antarctic stations.

Noteworthy among these variations is the significant disparity in weekly working hours experienced between summer and winter, with the workload reduced by half during the winter period for certain staff members.

At the end of 2019, while I was absorbed in the whirlwind of work and activities characteristic of the austral summer, a member of the technical staff from the 69th expedition to Adélie Land (TA69; TA stands for Terre Adélie) proudly showed me a hand-made guitar with a sculpted neck representing the bust of an emperor penguin. It was a gift for one of the members of his crew, a particularly meticulous collective effort that, as this overwinterer told me, 'took a long time'. This act of gift-giving was my first encounter with the circulation of Antarctic time in an exchange system. As the ensuing months unfolded and my observations multiplied, the exchange of material gifts emerged as a component of a multifaceted and intricate temporal economy.

Time has been recognized as a valuable and fluctuating economic resource (Becker 1965, Gardes 2021). At DDU, the significance of time is even more pronounced due to the relative absence of money in the daily lives of the station members. Since the first winter-overs in modern French stations, there has been a desire to eliminate what was perceived as a divisive factor: 'money is abolished; all resources and transportation are shared' (Marret 1954, p. 51). Within the station, there is hardly anything to purchase except for a few items like postcards or T-shirts. Nevertheless, occasional bitter jokes and tensions about salary differences hint at its underlying presence. Fuel oil, food, clothing, building materials, tools and other consumables are all imported. Time, and more particularly 'free time', becomes one of the few resources that winterers have some control over. The wooden guitar in

the shape of a penguin made during the spare time of the TA69 represents one manifestation of gift-giving within the station. However, these tangible goods constitute a minority in comparison to the predominant exchanges, which is services and volunteering.

This article begins with an examination of the methodology and a literature review, succeeded by a comprehensive presentation of the study's results. These results first define the terms 'work' and 'free time' in this Antarctic context. These two activities may be closely linked, and there is a distinction between imagined expectations and lived realities. Quantifying the number of hours per week devoted to these different activities makes it possible to define the time that circulates and is exchanged between the 70th expedition in *Terre Adélie* (TA70) members. This ethnographic study of services and volunteering, taking away from the free time of the overwinterers, examines the diverse manifestations of these temporal exchanges while also recognizing that social relationships within a winter crew cannot be reduced to mere accumulation. As the discussion progresses, our interest shifts from an individual perspective to the broader social structure of the group. By analysing the causes and consequences of personal decisions, we gain insights into the social dynamics of a group of individuals isolated in an extreme environment.

### Literature review and methods

Economic anthropology, a discipline that emerged in the 20th century, analyses the economic activities of human populations. Bronislaw Malinowski's fieldwork in Papua New Guinea, focusing on the *kula*, and the earlier works of Franz Boas and Marcel Mauss on ceremonial exchanges laid the foundation for this field (Boas 1899, Malinowski 1989 [1922], Mauss 2007 [1924]). Since then, anthropologists have enriched these studies, providing insights into the production, distribution, exchange and consumption of various goods, services, knowledge and more (Carrier 2005, Hann & Hart 2011). Today, their interests have diversified and, while the study of 'traditional' exchanges is still relevant, economic anthropology also covers questions of value (Appadurai 1986, Humphrey & Hugh-Jones 1992), debt (Graeber 2013) and financial markets and institutions (Ho 2009, Gudeman 2015).

In this article, I am not examining the complex financing systems of Antarctic stations, nor the tourism and fishing industries. My interest is specifically in the economic exchanges between the members of a station, which, as pointed out in the 'Introduction' section, seem to represent a contradiction due to the near absence of money. However, upon reaching DDU, my working hypothesis posited that exchanges existed everywhere, even if they are not the same everywhere, and that humans have a propensity for exchanging one thing for another (Godelier 2008). I am therefore focus on three obligations - what anthropologists refer to as 'reciprocity': the giving, receiving and repaying of objects, services, ideas, words, magic, favours and so on. Mauss emphasized these three interrelated obligations and, together, they constitute giving or reciprocity (Mauss 2007 [1924]). In other words, there would be no such thing as 'free gifts' (Gudeman 2015). Thus, if economic exchanges and the concept of gifts exist universally and, in our context, manifest themselves in exchanges of 'free time', it is important to define this term and its implications.

Free time, whether in France or Antarctica, is the period not devoted to essential survival obligations within a society. This excludes time spent working, eating, sleeping or on household

chores. A TA70 technical staff member expressed a relevant perspective: 'I thought that winter would be more relaxed, with much more personal time than I currently have.' This winterer contrasts expectations with reality, emphasizing 'personal time' vs time for professional duties, for 'others'. Thus, there is a distinction between time allocated to fulfilling station obligations and 'free time' dedicated to rest and leisure. My initial hypothesis is that free time is the cornerstone of an exchange system essential to the smooth running of an Antarctic station.

Conducted from November 2019 to January 2021 at DDU, my research explores social dynamics within the station during two summer campaigns and one wintering period. As a member of TA70, one of two ornithologists of the crew, I conducted an ethnography as part of my PhD. This project was explained at a every stage of my recruitment, and transparency in the field was a key aspect of my methodology. The data collection, analysis and interpretation presented in this article are primarily based on participant observation. Exchanges with crews were documented in a logbook, a few of which are included here with ensured anonymity and explicit consent. No audio or video recordings were made; all data for this article and future publications stem from daily observations, detailed notes in notebooks and numerous responses to inquiries posed to station personnel.

At DDU, in 2020, the TA70 expedition comprised 24 overwinterers (4 women and 20 men), with a quarter having prior Antarctic experience, fostering the transmission of Antarctic heritage. The winter crew, categorized into scientists, technical staff, meteorologists, the French Southern and Antarctic Lands personnel (Terres Australes et Antarctiques Françaises or TAAF) and kitchen staff, revealed a diverse administrative and organizational structure. This structure included the French Polar Institute Paul-Émile Victor (IPEV) managing functional aspects and scientific projects, the TAAF ensuring sovereignty and public services and three Météo-France agents providing weather support. This approach avoids viewing the Antarctic station as a static entity, acknowledging its dynamism in space, time and population (Pottier 2022).

This multitude of subgroups and identities is equally applicable to the author of this article, who cannot be exclusively construed as an anthropologist. While I was indeed a doctoral student in anthropology, I was also a biologist-ornithologist, an overwinterer, a woman and a civic service volunteer. As a member of TA70, I have received gifts and I have actively participated in the exchange system described in this study, engaging in the reciprocal giving and receiving of time. I would also like to highlight that the majority of my temporal commitments were directed towards my responsibilities as a biologist, where my foremost dedication lay in ensuring the functioning of scientific programmes throughout the winter. Each of these elements needs to be taken into account to place me in the social and hierarchical landscape of DDU. The immersive nature of participant observation enabled me to observe the complexities of economic exchanges beyond the explicit transactions, uncovering the nuances of reciprocity and social bonds. Yet, it is essential to acknowledge the impact of my presence within the group and on the exchanges themselves. I have included a few examples throughout the article.

Whereas during previous ethnographic fieldwork my efforts were focused on trying to get close to the people I was studying, one of my concerns during this Antarctic fieldwork was to distance myself from a place I could not leave. Careful examination, detachment as much as awareness of an attachment to my fellow

winterers and constant internal dialogue were parts of the reflexive method employed throughout the research fieldwork at DDU. I did not intentionally exclude myself from the purview of this study; rather, I am a participant among the 24 individuals of TA70. In this particular ethnographic context, an omnipresent reflexivity is required to be conscious of my position in the community studied, of my writing choices and my interests - in order to produce the least possible distorted knowledge of the social world (Harding 1987).

Finally, and while the findings offer insights into DDU, they are not universally applicable to all Antarctic and sub-Antarctic stations. Each station, with their unique geographical, environmental and cultural aspects, requires context-specific interpretation. This research emphasizes the importance of comparative studies to avoid generalizations across the diverse Antarctic and sub-Antarctic landscape.

## Results

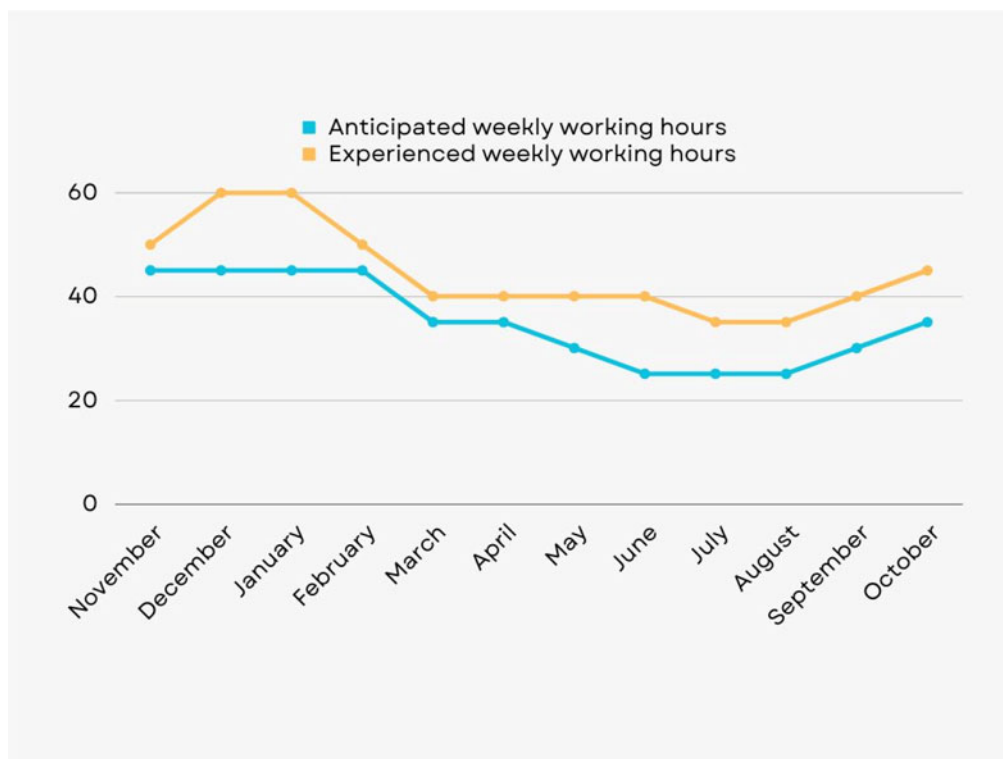
### *The anticipated and experienced time*

In September 2019, like each year, overwinterers from DDU, Concordia and sub-Antarctic Island stations gathered at the French Polar Institute for a week of exchanges, training and conferences. The upcoming winter promised various activities such as igloo building, pack-ice skiing, language learning and skill acquisition, endorsed by polar institution counsellors to combat boredom. Free time seems to be an abundant resource during the winter, but it can become detrimental to the well-being of individuals if they cannot find engaging activities to occupy themselves. However, during the first summer campaign, at the

end of 2019, outgoing winterers from TA69 described Antarctic time as both 'interminable and fleeting'. Similarly, during the second summer campaign, a TA70 overwinterer expressed frustration over organizing work and joint activities: 'everyone has a minister's timetable'. This contrast highlights the disparity between the perceived calm monotony of winter and the actual fatigue and busy schedules in the station. Discussions with TA69 and TA70 members allow us to compare variables and visualize the average weekly working time of an 'average overwinterer' throughout the Antarctic year, from November to October (Fig. 2).

The term 'average overwinterer' is frequently mentioned in the field or during the training week by IPEV or TAAF staff members. While sometimes used seriously and other times with humour and irony, it is challenging to define what constitutes an average overwinterer due to the heterogeneous population at each station. Determining the hours dedicated to job-related tasks throughout the year is equally complex, given the diverse and multiple responsibilities of winter workers. For example, the IT specialist's responsibilities include managing the station's network and computer systems, setting up telephone networks, providing support and maintenance for staff and actively participating in the installation, maintenance and data collection of instruments used in seismology, magnetism and biology programmes. Each individual has their own specific tasks and responsibilities towards the station and their employer(s). Figure 2 represents the hours associated with these professional obligations.

The number of weekly working hours at DDU is influenced by factors such as function, weather conditions, seasons, project scale and individual characteristics (including health, motivation and personality). Though not capturing individual fluctuations,



**Figure 2.** Graphical representation of the difference between the average weekly working time anticipated by winter workers before their arrival at Dumont d'Urville Station and the working time actually experienced in the field (monthly variations over a year).

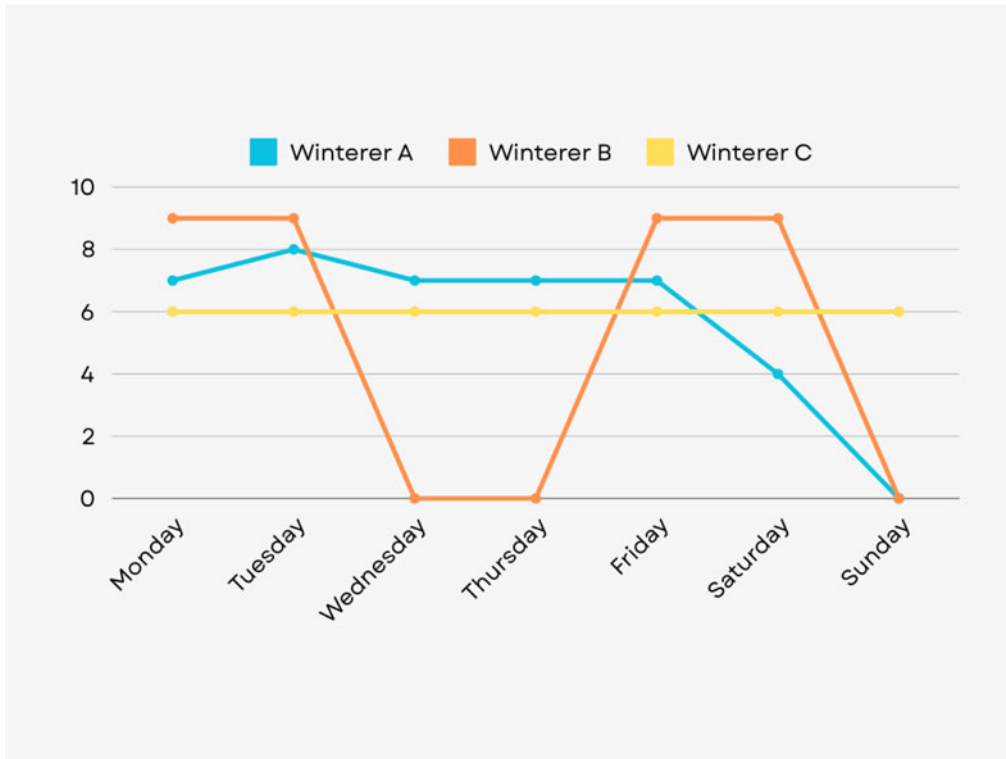


Figure 3. Numbers of hours devoted to professional tasks over a week (sample of three overwinterers).

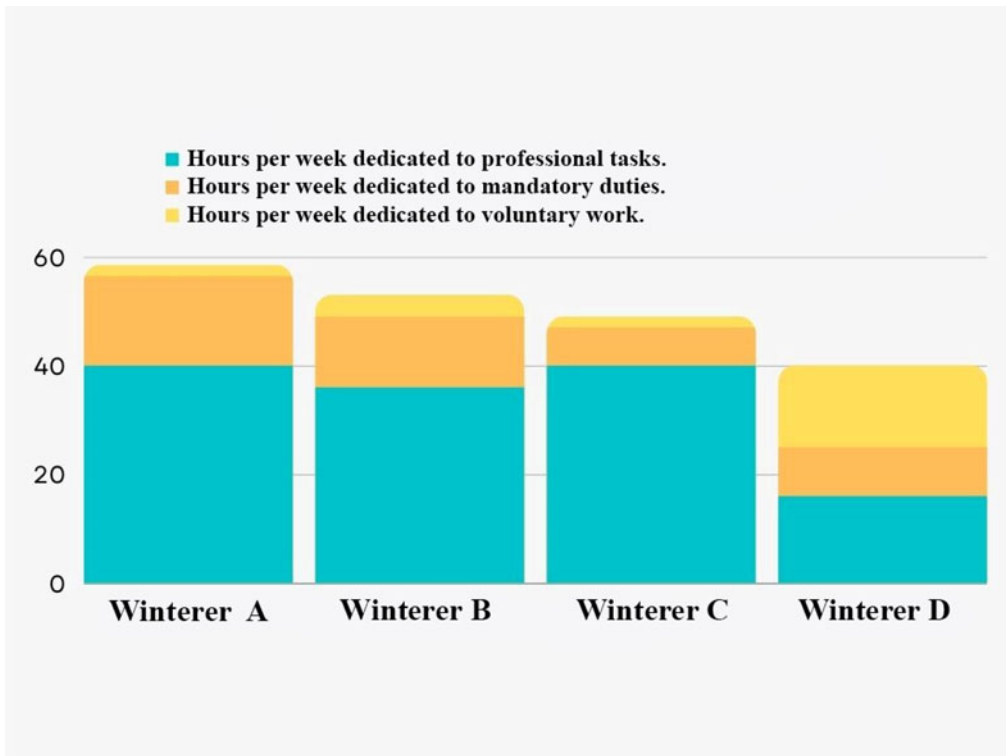


Figure 4. Graph summarizing the three categories of tasks devoted to the station and to the crew members (sample of four overwinterers).

Crew member	Professional sub-group	Number of hours per week (professional & mandatory duties)
A	Technical	≈50/60 hours per week on average
B	Météo-France	≈40/50 hours per week on average
C	Scientific	≈40/50 hours per week on average
D	Scientific	≈20/30 hours per week on average
E	TAAF	≈20/30 hours per week on average
F	Kitchen	≈40/50 hours per week on average

**Figure 5.** Professional subgroups and numbers of hours worked by six reference winterers. TAAF = Terres Australes et Antarctiques Françaises.

Fig. 2 offers a meaningful overview to initiate our analysis of over-winterers' time management. The Antarctic imaginary of over-winterers, nurtured by books about Antarctica and the many blogs written by former crewmembers, anticipates a fluctuating workload based on seasonal changes. Summer is intense, followed by decreased activity with diminishing sunlight. Winter represents an abundance of free time. September and October witness increased activity with spring's arrival and preparations for the next summer campaign. In terms of annual variations, anticipated and experienced working hours are similar. However, a contrast appears during the first half of winter, as the average working time for the 70th expedition remains stable until Midwinter instead of gradually decreasing. The difference lies in the actual number of hours dedicated to tasks weekly. Throughout the year, the 'anticipated' curve is consistently lower than the 'experienced' curve, notably with a 15 h gap in summer. In December and January, winterers work an average of 60 h per week. As February approaches, work intensity decreases, settling at ~40 h per week for most of the winter, comparable to working hours in France. It is important to note that variations exist among different individuals, and attention is given to the risks of burnout and boredom. However, these hours represent a general average for the entire TA70.

#### *Time devoted to professional tasks, mandatory duties and voluntary work*

To look in more detail at the distribution of working hours and the heterogeneity of weekly schedules for different functions, let us take the example of three schedules of three different winterers during a typical week (without incident, breakdown or blizzard; Fig. 3).

Winterer A is a member of the technical staff and follows standard office hours, working from 08h00 to 17h00 or 17h30 on weekdays, with an additional hour on Tuesday. Saturday mornings are dedicated to work from 08h00 to 12h00, resulting in a ~40 h workweek. Winterer B is one of the two weather forecasters at the station. They alternate every 2 days at the operations station, working from 07h00 or 08h00 to 19h00 or 20h00. Their tasks include preparing weather reports and collecting measurements. Winterer B completes 36 h of work per week as an official Météo-France forecaster during the wintering period. Finally, winterer C, a member of the scientific group, carries out daily work without regard for Sundays, as earthquakes and penguins do not follow a weekly schedule. Scientists have flexibility in their working hours and do not have immediate hierarchical superiors, except for the station leader. They submit monthly reports to their contact at the French Polar Institute and to the heads of laboratories in France. Winterer C works an average of 6 h per day, resulting in a total of 42 h per week.

While Fig. 3 shows the heterogeneous nature of a station's schedules, it also consolidates the average 40 h week experienced by the winterers. However, these schedules do not encompass two significant aspects of Antarctic work. Firstly, there are the mandatory tasks, such as cleaning the station and being a part of the fire brigade or rescue team. These duties are not voluntary, as one of the TAAF staff members points out: 'Being part of a rescue team is false volunteering. You have a choice between the three groups, but otherwise it's an obligation. If no one had volunteered, I would have had to divide the crew into these three groups myself.' Once the overwinterers have completed their professional duties and mandatory tasks, the free time they have left can be transformed into volunteering, the third form of work on an Antarctic station. Figure 4 incorporates these additional elements.

In contrast to Fig. 3, which illustrates the weekly variations in the schedules of the overwinterers, Fig. 4 shows the total weekly time spent on different forms of work by our three TA70 members. I have added winterer D, also a scientist, who works every day of the week like winterer C but has a lighter workload. By considering the comprehensive picture depicted in Fig. 4, we gain a more nuanced understanding of the holistic involvement and commitment of winterers to their duties and responsibilities within the Antarctic context.

Differentiating between mandatory duties and voluntary work can be a complex endeavour, with activities sometimes shifting categories based on various factors, such as the urgency of the situation. Mandatory tasks have the potential to significantly extend the workweek. For example, winterer A's initially intended 40 h per week transforms into a demanding 56.5 h per week due to rescue training on the Saturday afternoon of our sample week and the 'day shift'<sup>3</sup> on Sunday. Winterer B assumes the 'service base'<sup>4</sup> on Thursday and assesses pack-ice conditions for fuel transport on Sunday. Winterers C and D also take on various additional tasks such as waste sorting, fire watch duty, assisting other scientists and more. Figure 4 intentionally highlights the accumulation and diversity of these obligations beyond the primary professional responsibilities. When these additional tasks are added, it appears that some people devote > 50 h a week to their work during the 'calm' winter period. On the other hand, it is important to acknowledge that there are also individuals with lighter workloads, averaging between 15 and 25 h per week, including mandatory tasks.

These shared obligations, which apply to all station staff, are insufficient to bridge the gap between different schedules, resulting in an uneven distribution of free time among members of the same crew throughout the winter. Overlooking this information means disregarding the potential tensions that can arise due to these disparities. Such circumstances can place individuals in an uncomfortable social position, as any form of inactivity is often viewed negatively.

I think people quickly understood that if I was working fewer hours than them, it was because I hadn't been assigned as much tasks. It didn't just fall into my lap. However, the fact that I actively assisted with other tasks, such as at the BT [*bâtiment technique*, referring to the technical office] or other tasks, helped people to refrain from judging me solely based on my work hours.

- One of the TA70 scientists, June 2020

The scientist's statement here aligns with the findings depicted in Fig. 4, specifically regarding the winterer's dedication to volunteering. In the case of winterer D, who has a relatively low workload of ~20–30 h per week, voluntary work becomes a significant component, comprising ~40–50% of the overall workload. It is noteworthy that one of the Météo France agents from TA70 would willingly spend 1 or 2 entire days of his weekly time off to contribute to tasks at the BT, to the extent that some winterers

<sup>3</sup>The 'day shift' entails overseeing the power station between 06h30 and 20h00, while the 'night shift' covers the remaining hours. These responsibilities are assigned to the technical staff. Throughout the week, the two power station mechanics handle monitoring and maintenance during their working hours. However, during weekends, a designated technical staff member assumes the responsibility of monitoring these hours in their entirety.

<sup>4</sup>Unlike some stations, which have employees responsible for cleaning or helping the cook, at DDU these tasks are devolved to the overwinterers. Each day, two members (three in summer) are responsible for cleaning the communal areas, serving in the dining room, assisting the cook and handling waste disposal duties.

even nicknamed him the 'second technical supervisor'. Engaging in voluntary tasks by sacrificing personal free time serves as a means to combat boredom, reconcile divergent schedules and establish a distinct role within the expedition's social structure. Following from this definition of free time and its integration into the crew's schedule, we can now examine how the members of TA70 exchange it.

### *The four types of time exchange*

In September and October 2020, some of the TA70 crew shovelled snow from large drifts formed during winter. The task divided opinions, with some considering it a mandatory duty for the summer campaign preparation, while others questioned the need to volunteer. The latter group could not comprehend why they were required to engage in this exhausting task, especially when there was a dedicated member of the summer staff employed for precisely this purpose. Late in the afternoon, as I was leaving the marine biology laboratory, I noticed a small group shovelling the snow that had frozen the kitchen windows all winter long. I joined them, as I had a bit of free time on my hands and it was a pleasure to work with people from other professional subgroups. A little while later, two additional winterers arrived on the scene. One of them appeared visibly displeased, expressing discomfort in his back and arms from the exercise. He voiced his discontent, pointing out that it was consistently the same individuals who took charge of such tasks, while others who seemingly contributed little were featured in the 'Picture of the Day', a photograph showcased on the DDU intranet homepage. Following this brief exchange, the dissatisfied crew member departed as abruptly as he had arrived, without helping. Later that evening, in conversation with a member of our snow-clearing team who had witnessed the scene, this person diplomatically pointed out, referring to this unhappy winterer: 'He helps out a lot, credit to him for that, but he also has significantly less work to do than other member of the crew.'

In this simple scene from everyday life, we find many aspects of this circulation of time and services. It encompasses the divergence and misinterpretation between those who perceive a task as mandatory and others who view it as secondary and nearly futile voluntary work. It encompasses the pleasure of helping and creating bonds with people who belong to other professional groups and with whom it is rare to share common work. It encompasses the verbalization of this circulation of mutual aid and of a perceived injustice between 'those who help' and 'those who do nothing'. Lastly, it also encompasses the value of time, a scarce resource for some winterers and an abundant one for others. This brief moment captures the complexity of the Antarctic exchange system and the social bonds it entails.

During my fieldwork, a TA69 winterer revealed his aversion to seeking help, fearing dependency. This sentiment resurfaced in rare conversations with a few members of TA70 and TA71. The existence of time-based gifts and resulting indebtedness among winterers often remains unspoken. During the end-of-winter snow clearing, discussions around this exchange system emerged, with winterers scrutinizing those they believed contributed less. Nonetheless, mutual aid, time-giving and the social consequences of unfulfilled obligations largely operate in the realm of collective unspoken exchanges.

The aim here is not to provide an exhaustive list of exchange forms at DDU during the 2020 winter. Instead, categorization of these exchanges is undertaken for improved comprehension, with emphasis placed on a sample of six individuals from TA70

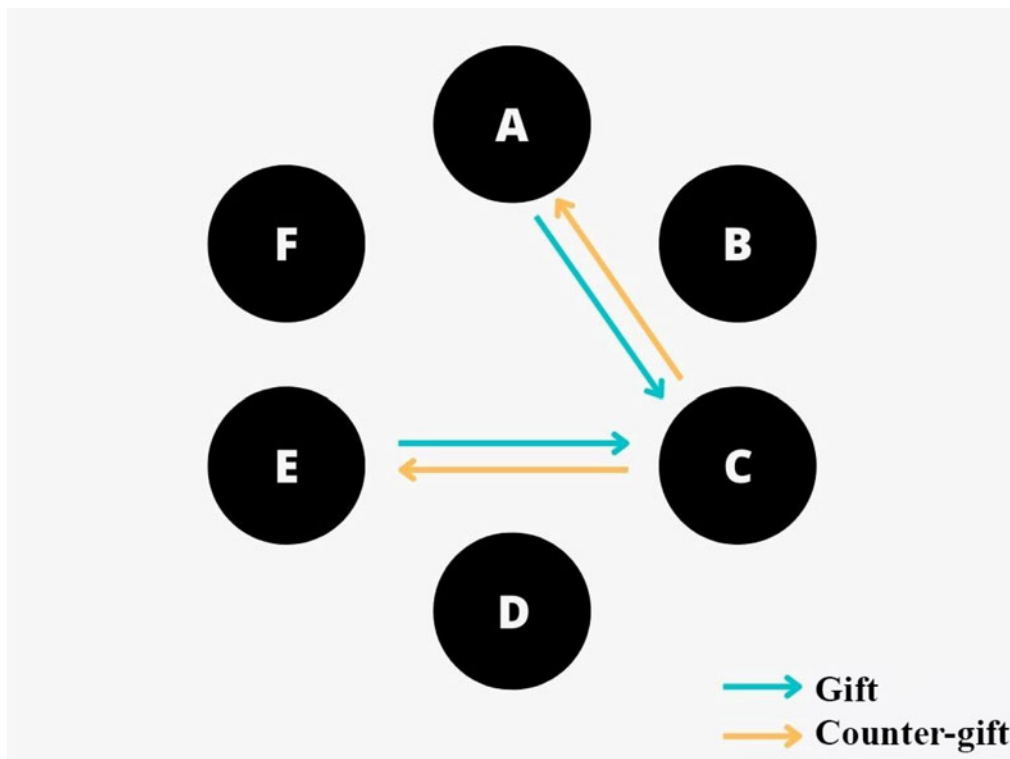


Figure 6. Simple circulation of time and services within a winter-over crew.

(Fig. 5). This sample represents the various professional sub-groups within the station, with different working hours. Wintering workers A, B, C and D are included, along with winterer E from the TAAF staff (representing those with a 'light' schedule) and winterer F from the kitchen team (representing the average schedule).

In the following example (Fig. 6), an individual (C) requires assistance in installing a measuring instrument on the pack ice. He seeks help from another TA70 member (E), who joins him in preparing for the operation. Meanwhile, another member (A) happens to pass by and observes them laden with shovels, pick-axes, solar panels and scientific equipment. Without being asked, winterer A offers his help. As a result, winterer C receives both solicited and an unsolicited voluntary help. We can therefore assume that winterer C becomes indebted to winterers A and E, and that complex calculations follow to repay this debt, taking into account the solicitation, the value of the donation in relation to the workload of the two winterers, the affinities of each, etc. In our example and in the days and weeks that followed, winterer C helped winterer A to install and move equipment on the station and winterer E to wash the dishes. This is a 'simple exchange', as illustrated in Fig. 6. This cooperation can be restricted to a few individuals or extended to a larger group, depending on the scale and urgency of the task.

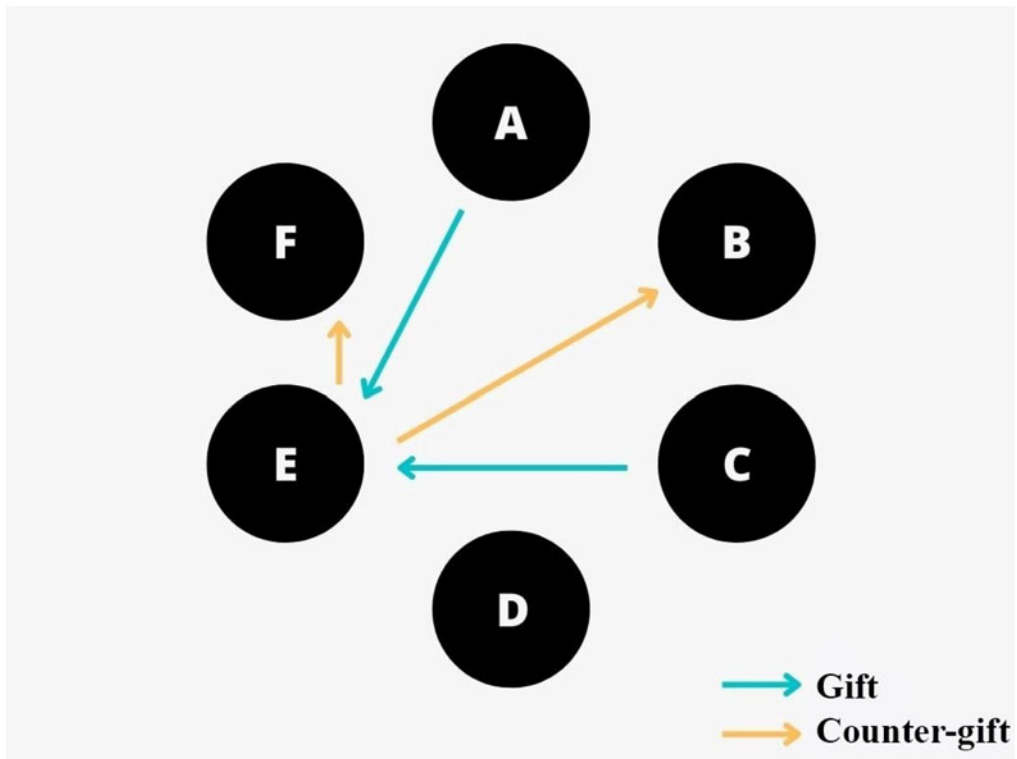
In the second example, winterer E incurs two debts with winterers A and C, which he repays by helping winterers B and F (Fig. 7). This debt can also be repaid through a counter-gift, by helping one or more members of the crew who are not involved in the original exchange. On an Antarctic station, the most important aspect is not to make a gift of time to a particular person, but to take the time to help and participate in voluntary tasks. The essence of counter-giving lies in avoiding the tendency

to assist only certain individuals repeatedly. For instance, in the given scenario, if winterer E receives help from the entire group but only reciprocates assistance to winterers B and F, the support received by winterer E will gradually dwindle and eventually cease. Consequently, winterer E becomes reliant on the availability and goodwill of winterers B and F, resulting in a potential sense of being 'imprisoned' by their assistance. To sustain a healthy exchange system, it is essential for individuals to contribute and reciprocate help across the entire community, fostering a balanced and mutually beneficial environment.

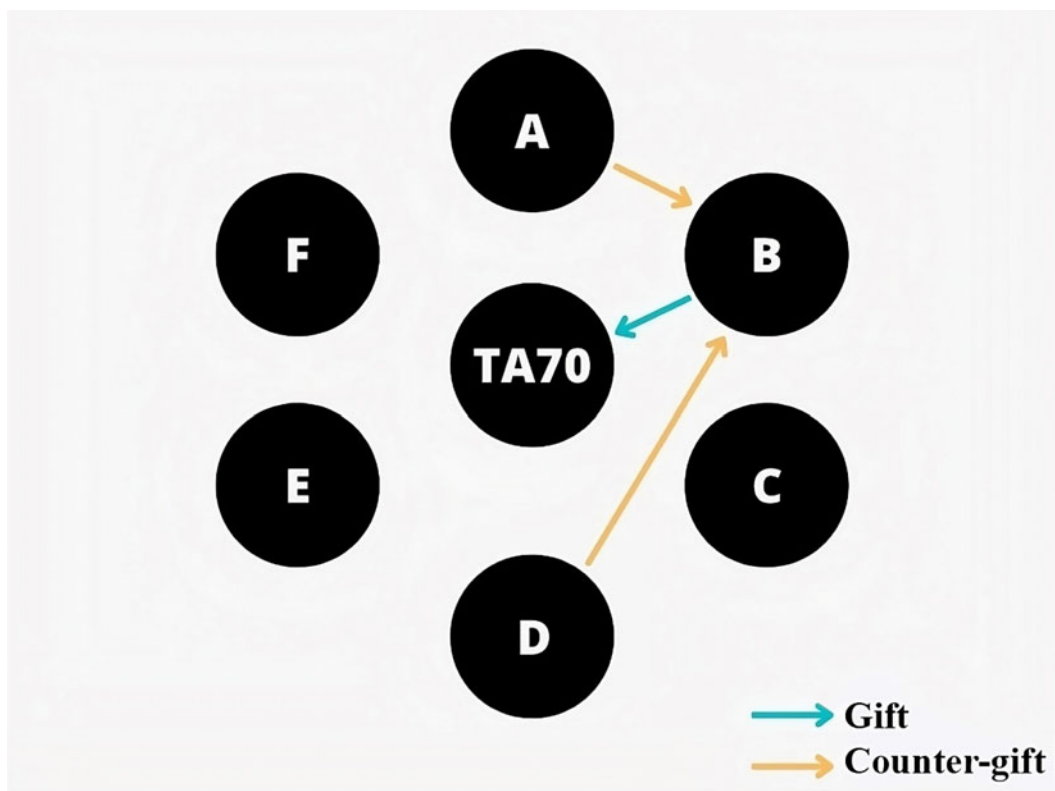
The third scenario involves the exchange of gifts among over-winterers through undifferentiated actions (Fig. 8). This is exemplified by the meteorologist, winterer B, who consistently clears the snow from the footbridges after each blizzard. By offering his time and effort to the entire community rather than specific individuals, winterer B receives counter-gifts in return. These gifts bestowed upon the community manifest in various forms and can be either individual or collective. Individual acts may involve preparing and delivering a class or a presentation, while collective acts may encompass several winterers collaborating to prepare a meal, crafting gifts, organizing sports or artistic activities and so on.

The fourth form of exchange is characterized by immediate reciprocity (Fig. 9). Gifts and counter-gifts are exchanged simultaneously, resulting in an immediate cancellation of obligations. Biologists, for example, occasionally seek assistance with equipment or note-taking, and, in exchange, the helper gains access to approaching animals and exploring beyond the station. As an ornithologist, this is a form of exchange in which I was often involved. Biologists and ornithologists at all the stations have the reputation of being part of the personnel with a busy schedule. These exchanges allow them to take part in collective activities by

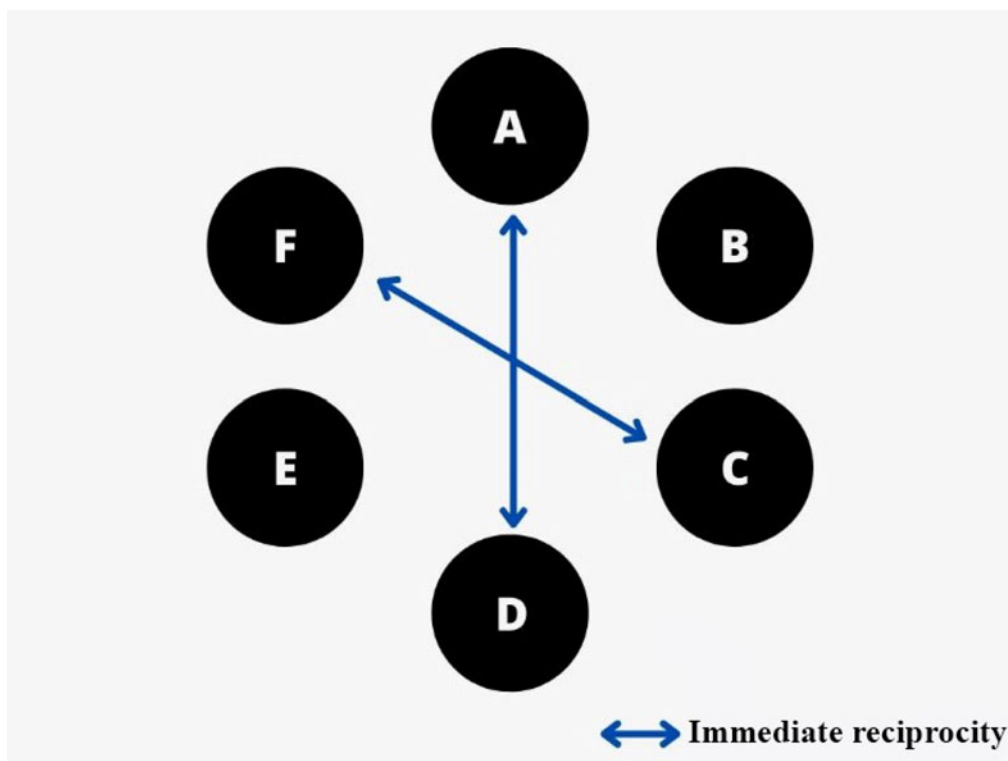




**Figure 7.** Interposed circulation of time and services within a winter-over crew.



**Figure 8.** Undifferentiated circulation of time and services within a winter-over crew. TA70 = 70th expedition to Adélie Lane (TA = Terre Adélie).



**Figure 9.** Immediate reciprocity of time and services within a winter-over crew.

asking one or more people for help, and to spend time with them outside of the station. Similarly, the technical staff willingly impart their knowledge and teach newcomers the operations of the various machines they work with, reciprocated by receiving a helping hand in return. This immediate reciprocity creates a mutually beneficial exchange where both parties contribute and receive simultaneously.

The observed exchanges of services and mutual aid at DDU provide valuable empirical data for our analysis. However, it is important not to confine our understanding solely to the descriptive circulation of time and the four patterns identified. To do so would be reductionist, as it neglects various other influential factors such as the environment, hierarchy, affect and more. These gifts of free time, along with the search for reciprocity that they inspire, are intertwined within a broader system. The exchange of Antarctic time is shaped by underlying motivations and sanctions that enable various outcomes depending on the circumstances and context. It can facilitate the formation of alliances, enable individuals to distinguish themselves from the group, foster team spirit and so forth. For instance, in Fig. 6, the arrows indicate an exchange of time of equivalent value between winterers A and C. However, Fig. 6 provides no insights into the nature of their relationship. Are they friends, enemies or romantic partners? Are they male or female? Is this an exchange of time between two autonomous individuals or are they acting on behalf of the respective subgroups to which they belong? While this article focuses on the theory of indebtedness and reciprocity of Antarctic time from a general perspective, it is important to acknowledge that, within the system itself, there are variations and distinctions that would be worth exploring in future research. Examining potential hierarchical links

between individuals is also crucial to comprehending the dynamics at play.

## Discussion

Our exploration of Antarctic time begins with the question of whether free time is abundant, reflecting the Antarctic imaginary, or scarce, as reported by TA69 and TA70 overwinterers who do not have as much ‘personal time’ as expected. It is not coincidental that I initiated the presentation of results through the differentiation between the anticipated working hours before their departure to Antarctica and the actual time experienced on the station. The concept of abundant free time, along with the potential boredom it entails, is present in polar imaginary and in studies on the stress of polar winter-over. Some overwinterers struggle to occupy their time, requiring inner resourcefulness to avoid boredom-related issues (Décamps 2003). The monotony of daily life and limited variety in indoor activities contribute to boredom for some individuals (Sandal *et al.* 2018). Émilie Giret, who conducted post-doctoral research on the sub-Antarctic archipelago of Kerguelen, describes overwinterers trapped in a state of torpor that persists throughout the wintering period (Giret 2006, p. 447).

The station’s location and population are crucial, influencing the winter experience. Wintering with 24 people is different from wintering with 12, involving distinct challenges and dynamics, as this TA70 scientist points out at the end of the winter (October 2020): ‘At 24, you don’t really have time to get bored. Of course, it happens, but in a similar way in France. I have a lot of free time, I’m not one of those people with a crazy workload, but if I want, I can find some. There’s always something to do, someone to help. For me, boredom is also a choice.’ This

winterer's experience highlights the importance of volunteering and staying active. At DDU, the adage 'A happy winterer is a busy winterer' is often heard, albeit with slight variations. Work seems to ensure the fulfilment of individuals in their environment (Veltman 2016). Previous studies at Amundsen-Scott South Pole Station show that expeditions with high morale consist of hard-working individuals, and that a winterer's status and position within the crew are primarily shaped by their professional performance, with a focus on their willingness to work and assist others rather than pure technical skills (Johnson *et al.* 2003, Wolak & Johnson 2021).

In the approach to free time as an economic resource exchanged through gifts and counter-gifts, I initially posited that scarcity leads to higher value. Nevertheless, while scarcity may inherently possess value, it is not universally applicable. The concept of value is socially constructed and culturally relative (Cresswell 1975, Appadurai 1986, Graeber 2001). The value, in the economic sense, of Antarctic time is linked to the philosophical, or sociological, values prevalent in the continent's stations. To develop a theory of economic exchange in Antarctica, I must move beyond the individual perspective and consider the social structure as a whole. Figure 6–9 illustrating the four types of exchange are useful for laying the foundations of this and providing a visual representation, but they make it difficult to appreciate the paradoxical nature of social life and the ambiguity of exchange systems (Weiner 1992).

The value of time evolves in a moral economy - the exchange and use of moral sentiments, values and norms in a social space (Fassin 2009, Hann 2018). In Antarctica, certain values include mutual aid, hard work and active engagement in crew life. Some members of the IPEV or the TAAF have repeatedly told us overwinterers how lucky we are to be in Antarctica and that 'many people would pay to be here'. This leads some overwinterers to feel morally indebted and to give a lot of their time to their work in order to uphold the values presented to them. On the other hand, other overwinterers feel resentful towards these institutions, which do not appear to acknowledge the sacrifices they have made to reach Antarctica, and they want to 'make the most of it' by favouring recreational activities. These moral dimensions influence the value of Antarctic time, and most winterers try to maintain a balance between self-interest and mutuality, two elements that are also found in economics (Gudeman 2015).

It is also noteworthy that these values change over time, and for some winterers Antarctic work takes on an almost absurd quality. Just like in many jobs beyond the Ice Continent, there are inevitably elements that may seem idiotic or futile - a side effect of managing a complex organization (Graeber 2018). The challenges of administering structures in a harsh and isolated environment, the multitude of organizations involved and the annual turnover of winter workers all contribute to the emergence of tasks perceived as 'a waste of time'. However, the absurdity of Antarctic work extends beyond these day-to-day challenges, prompting overwinterers to engage in profound reflections on their presence in the stations. The recurring question heard in the field of 'What are we doing here?' echoes not only the sentiments of the individual posing the query but also encompasses all individuals inhabiting the frozen continent. This question is intertwined with ecological values, inquiries into sovereignty and contemplations on humanity's relationship with nature. Individuals possess a sense of the social value inherent in their work (Graeber 2018). If the exchange of material gifts is a sample of

the complexity of time exchanges on a station, these time exchanges are a sample of Antarctic work.

Viewing free time as a given resource highlights that recipients not only receive but also become indebted to the giver (Godelier 2008). Theoretically, when winterers receive help, they have a moral obligation to repay the favour, creating a cycle of reciprocity. As one TA70 technical winterer pointed out in June 2020: 'Everyone needs help at one time or another. It's literally impossible to just do your job. Nothing would work. We have no choice but to help each other.' By dedicating their free time to assist other crew members or contribute to the station, overwinterers create goods or services that fulfil needs, save time and energy for the receivers and foster social connections through indebtedness and reciprocity. While volunteer tasks, such as painting walls, cooking for the group, carrying heavy loads, organizing events and more, may not be individually essential for the station's survival, the whole exchange of voluntary work during overwinterers' free time is crucial for the smooth functioning of the station and the social balance of the crew.

In the 'Results' section, I mentioned that counter-gifts can take different forms and are unspoken. I might add that they are often approximate. No one says to themselves: 'This person helped me tinker with the electrical cupboard for 42 minutes, so I will have to make a similar effort for the same amount of time in order to repay my debt.' It is important to clarify that giving is not solely driven by contracts, debts and calculations, but is primarily a social act that fosters the creation of bonds (Weiner 1992). David Graeber also challenges the notion that all social and economic interactions are based on self-interest and argues that human history is rich with instances of mutual aid and generosity. I align with this activist anthropologist's perspective on human nature, emphasizing that moral obligations extend beyond mere mutual benefit (Graeber 2013). However, although there is a real pleasure in helping others without the individuals keeping strict accounts of each other's help, we cannot ignore the fact that there is a general motivation among the overwinterers: the aim is to keep the station 'balanced'. On a daily basis, the staff's inclination towards fostering 'harmony' or consensus within the group, the avoidance of conflict and a deliberate effort to 'hold back' are openly discussed within the station.

In the isolation of this hostile continent, personal and collective interests become intricately interwoven. The main concern of the members of the station is to ensure the smooth running of the facility and to guarantee their survival. A secondary interest emerges: the aspiration to make the most of the Antarctic winter and, maybe, to return someday (Palinkas & Suedfeld 2021) - in other words, to enjoy a pleasant winter without conflicts. To achieve this, it is imperative to maintain the harmony within the group through an individual and collective interest in the balance of the exchange system, which cannot be observed without this juxtaposition of self-interest and mutuality, nor without the social context of the crew.

An Antarctic expedition consists of diverse professional sub-groups tied to station layout (Pottier 2022). There are numerous work pairs, often sharing the same building - for example, the pair of mechanics at the power station or the pair of electrician and electrical technician (Baquier 2013). These close collaborations emphasize mutual aid and reciprocity among these members. These exchanges can be horizontal or vertical, depending on the hierarchical positions and social ties of each individual (Yunxiang 1996). Duos, such as the two ornithologists or the cook/baker pair, and trios, such as the group consisting of the

geophysicist, physicist and computer scientist, engage in both horizontal and vertical exchanges depending on their hierarchical relationships and social ties. In hierarchical relationships, the counter-gifts are often less important for the person at the top of the relationship (Graeber 2013). Mutual aid between the pair members holds great importance, and exchanges between them are more frequent. The regulation of exchanges within these sub-groups contributes to the overall functioning of the station by alleviating the general workload.

The overwinterers contribute their time to ensure the seamless operation of the station, fostering social connections and preserving the social balance within the crew without keeping accounts as long as the debts are not too pronounced. At first glance, the most common type of exchange of goods/services on an Antarctic station seems to be generalized reciprocity, as described by Marshall Sahlins - a mode of exchange in which goods or services are given without the expectation of an immediate return on a specific timeline or an explicit agreement for a specific reciprocation (Sahlins 1972). This system differs from balanced reciprocity (obliging the recipient to return objects considered to be of equal value within a given period) and negative reciprocity (exchange in search of a material advantage or individual profit). Generalized reciprocity fosters a sense of community by emphasizing the importance of giving and sharing for the benefit of the group as a whole. The ideal type of Malinowski's (1989 [1922]) 'pure gift' is often associated with the lexical fields of generosity and hospitality.

However, the pressure felt by those who have fewer professional tasks to give more of their free time and the temporary isolation of an individual indebted to the group underline the fact that there is no such thing as perfect reciprocity. Additionally, the dissatisfaction of the winterer who was unhappy about clearing the snow from the footbridges while others 'do nothing' further emphasizes this point. The results show that the various forms of gift and counter-gift of time are very present in the daily lives of the winterers. Perpetual indebtedness is necessary to the station's operations, to the group's balance and to an identity recognition developed further in this section. Debt is not something negative; it allows for a constant flow of social interaction, as settling accounts means both parties can part ways for good (Graeber 2013). Among the Tiv women in Nigeria, for example, debt and the perpetual exchange of reciprocal gifts enable the whole community to organize itself into cooperative subgroups and to evolve within a constant social flux (Bohannon & Bohannon 1968). In the isolated and hostile context of Antarctic stations, the desire of the overwinterers to maintain consensus make this system of exchange very flexible, which leads them to give their time even to a winterer in debt, and even knowing that they will not be repaid.

The role of economic exchange and mutual aid for survival in extreme conditions (notably poverty) has long been the subject of anthropological investigation (Susser 1982). The more challenging the environment, the greater the need for mutual assistance among group members. This harshness can stem from environmental factors as well as social factors. For instance, individuals from rural areas or disadvantaged neighbourhoods tend to help one another, reducing the costs associated with supply and demand, including debt (Graeber 2013). A relevant example, also quoted by Graeber, is the chapter titled 'Rendering service and jealousy' (Blaxter 1971) in the book *Gifts and poison: the politics of reputation* (Bailey 1971). This chapter explores the lives of workers and farmers in a rural department of the French

Pyrenees. Lorraine Blaxter distinguishes between mutual aid, such as lending a tool, and a significant favour that introduces the giver and the receiver into the realm of gifts and its broader implications. The tipping point for mutual aid varies depending on the environment, and in the case of an Antarctic station, where the harshness of the continent is concealed by the comforts of modern facilities, mutual aid becomes crucial for survival. In other words, even if the two mechanics at the power station do not actively contribute to the group's tasks, they will always receive assistance, regardless of the time and energy required. This is because the functioning of the heating, running water and electricity systems, which are vital for the entire station, would be severely affected if the machines were to stop. The Antarctic environment and the group's isolation create a context where the implicit rules of giving, as described, for instance, by Marcel Mauss, become more flexible and adaptable (Mauss 2013 [1905]). However, these almost inexhaustible gifts of time do not mean that the indebted individual does not suffer the consequences of never offering a counter-gift.

During the 1975 southern winter at the American Amundsen-Scott Station, an individual's dissatisfaction in his work, the struggles with tasks and the failure to assist others led to his exclusion from the group (Wolak & Johnson 2021). During the TA70 wintering, all of the members fulfilled their professional duties and shared a collective understanding of Antarctic work, preventing any divisions forming between subgroups. While accounts and rumours from former overwinterers describe instances of crews being split between those who worked and those who 'thought they were on holiday', or of an overwinterer going on strike for an extended period, the ethnography lacks concrete examples or direct observations to explore the social consequences when an overwinterer refuses or is unable to fulfil their job responsibilities. In such cases, it can be assumed that the workload would be distributed among other members to ensure essential tasks are completed. In TA70, unanimous consent prevailed among all members regarding the team's overall working performance during the winter. However, disparities arose in the extent of participation in the free time exchange systems, leading to certain members accumulating debts within the group.

In order for the consequences of indebtedness to be felt, it must reach a noticeable level. Some overwinterers received continuous help during the first half of winter without reciprocating in the exchange system, only to see this assistance decrease. Subtle (and not-so-subtle) remarks during mealtimes serve as reminders of one's lack of participation in the station's mutual aid system. If the person in debt does not change their behaviour, the consequences are more significant, such as no longer receiving time from others for non-essential tasks. To avoid this, winterers with debts find their own solutions, such as dedicating extra time to their professional duties, even working on Sundays if necessary. Engaging in additional work allows these individuals in debt to occupy themselves and counter criticism by claiming that they do not have time to assist others. Increasing working hours helps individuals to reduce their involvement in voluntary tasks without being accused of idleness while identifying themselves as the person 'who works the most'. Work is undoubtedly tied to the basis of worth and recognition (Hann 2018). In the case of an indebted TA70 overwinterer, although he complained about the lack of assistance during the second half of winter, he was not ostracized by the group. As his workload increased towards summer, he received help and remained integrated within

the community, although it was located on the periphery of the social network. Indebtedness alone is not enough for a group member to become a 'social deviant' (Johnson & Miller 1983, Wolak & Johnson 2021) or a 'scapegoat' (Baquier 2013).

The tendency to seek and maintain balance through a system of exchanges that are beneficial and essential for everyone does not prevent certain individuals from offering help or creating gifts to leverage the social impact of such gestures. Even seemingly ordinary exchanges - as exemplified by Annette Weiner's reference to Christmas cards - allow individuals to construct a unique social identity, where their distinctiveness imbues the forms, actions and meanings conducive to fostering exchange (Weiner 1992). Similarly, the guitar shaped like an emperor penguin exemplifies a collective expression of the group's appreciation for an individual, but it also a means to forge social bonds during the manufacturing process and emphasizes the feeling of belonging to a community (not to mention, from a more pragmatic perspective, it occupies extended hours during the night-time surveillance of the power plant). Some winter workers, who have few hours to devote to their professional duties, give many hours of their time to volunteering, and are proud of it. They assume the informal role of party or activity coordinators and are perceived as such. They forge their own unique identities within the group, such as the meteorologist who is part of the technical team, proving their usefulness and autonomy (Veltman 2016). Other people who do not wish to take part in the exchange system will identify themselves as the person who 'works the most', as described earlier, or will even claim to be the outsider of the group. The exchange of time within an Antarctic station enables both collective functioning of the group and individual expression of identity within the winter expedition.

## Conclusion

In this article, I present an anthropological approach to examining Antarctic stations, specifically by exploring the concepts of gift, reciprocity and indebtedness. We have only scratched the surface of the complexity of this system of exchanging time and debts and their consequences for the social structure of a crew in an isolated environment. My aim was to introduce Antarctic work from the point of view of anthropology and to offer a glimpse of what this discipline can contribute to the study of stations and, more generally, of polar worlds. Exchanges are fundamental to human societies and communities, manifesting in diverse forms. By focusing on the dimension of time, we gain insights into various aspects of daily life in a station and the social dynamics of a wintering crew.

Through our analysis of time, I identify three distinct categories of work in the Antarctic context: professional tasks directly related to individual roles, mandatory tasks dedicated to community service and voluntary tasks derived from winterers' free time, which are contributed to the winter crew. The fulfilment of the first two categories is highly significant, driven by the division of labour and the specialization of each group member. The importance of volunteering, although less pronounced, should not be overlooked. In the isolated environment of Antarctica, volunteering takes on a critical role within the overall system of exchanges. Winterers convert their personal time into a quantifiable productive force, benefitting the recipient(s) by saving them time and energy. However, this process operates within a complex and structured system of exchanges, shaping the dynamics of the expedition.

To illustrate the dynamics of indebtedness and debt repayment, I have categorized the exchange of time and services into four distinct types: simple, interposed, undifferentiated and reciprocal exchanges. These classifications allow us to provide concrete examples and to emphasize the winterers' desire to establish a sense of balance within the group. It is important to emphasize that not everything revolves around calculations or formal contracts. This is especially true in Antarctica, where solidarity and the creation of social bonds - crucial for the station's smooth operation and the group's survival - often take precedence over individual interests. The exchange of services is not only necessary, as every winter resident will require assistance at some point during the wintering season, but it also ensures the maintenance of social relations and solidarity. At DDU, it is not only the circulation of debts that sustains social ties but also the multiplication and distribution of these gifts of time among all - or nearly all - members of the group. Individuals who contribute their time to different subgroups, be it for professional or recreational purposes, become physically and socially interconnected within the station.

The observed system of exchange demonstrates its remarkable adaptability, not only by multiplying different forms of exchange within itself but also by interacting with other components of the social structure. The balance of service exchanges, involving the free time of DDU staff, remains robust even in the face of defection by one or two overwinterers, as the group's self-regulation compensates for any shortcomings or excessive indebtedness. This raises a reasonable question about the nature of volunteering. The gift of time represents both an individual and collective exchange, serving as an instrument and expression of social relationships within a station. While volunteering is a form of resistance to calculating profit or treating community members as mere means to an end, it is nonetheless indispensable. It is necessary for the smooth running of the station, monitoring of scientific programmes, maintaining group balance and defining the role of a winter resident within their expedition.

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