# Swedish Food Technology in the 1940s and 1950s

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'We're going interstitial'.
William Gibson, *All Tomorrow's Parties*[1]

There was something fundamentally wrong with the way Swedish higher education and research were organized, a couple of articles in *Livsmedelsteknik*, a trade journal in the food technology sector, argued in 1955. Written in the wake of the International Conference on the Peaceful Uses of Atomic Energy held in Geneva in August 1955, the articles argued that while atomic science and technology were getting headlines as well as Nobel prizes, important breakthroughs in the food technology sector were more or less invisible. This 'atomic publicity' could cause permanent damage to Swedish society: young people about to choose their paths through the educational system might not realize that chemists, physicists, and technologists were not only needed in atomic labs, they were perhaps even more needed in the food technology labs. As a consequence, Sweden's intellectual resources risked becoming concentrated on the atomic technologies, whereas 'more traditional "fields of knowledge", with perhaps greater bearing on our everyday existence, are left without the insightful leadership it requires'. The articles rejected the view of the 1950s as an atomic age and instead prophesized future substantial technological developments in biochemistry and biology, sciences important to agricultural research and food technologies; therefore, 'a country needs more than atomic scientists, it needs more than atomic information'.[2] Thus, what was needed was increased 'respect' for food technology research and for politics to take into account the centrality of food technology in societal development, since it was a field on which public health and welfare depended.[3]

The two articles in *Livsmedelsteknik* were most likely written by Georg Borgström, the journal's editor and, as professor and director of the Swedish Institute for Food Preservation Research, an insider in Swedish food technology. I will not take Borgström's claims at face value. On the contrary, here I will emphasize the period's policy inventions and interest and support for food technology, from industry as well as state. Borgström's complaints can be seen as yet another instance of that standard trope in research policy rhetoric, so thoroughly documented by Daniel S. Greenberg: if one's own field doesn't receive sufficient funding, the whole country will go down the drain.[4]

First, we will discuss a number of more or less formal organizations in Swedish food technology and related areas, with particular emphasis on knowledge production, regulation, and the promotion of science-industry collaboration. Secondly, we will look at how arguments about research and development in the food sector often touched on the central issues of welfare and neutrality. Food safety, the provision of food in sufficient quantity, and other aspects of food are connected to public health and welfare, but food technologies were also important to notions about Swedish neutrality and the nation's ability to function during wartime. National security was not only a story about having a domestic production of computers, nuclear technologies, and fighter aeroplanes, areas where, as is well known, Sweden performed very well, for being the small state that it was: such warfare-related ideas were also actualized in the food sector. Thirdly, some examples of international contacts in the food technology sector will be given.

An interest in heterogeneous assemblies of scientific things – theoretical entities, empirical data, instrumentation, people – is a theme in one part of the literature on the recent history of science, technology, and medicine. 'The trading zone', where different subcultures of physics meet to locally coordinate action and belief; 'the boundary object', meaning different things to actors from different socio-cultural backgrounds; 'the boundary organization', an organizational broker between groups such as scientists and policy makers: historians of science, technology and medicine, and STS (Science and Technology Studies) researchers have deployed various theoretical concepts to capture the heterogeneous boundary-spanning and just a little bit messy reality of science in the making.[5] In the areas of the life sciences, medicine, biotechnology, and agriculture, the flow of instruments, organisms and concepts between different milieux has been emphasised: hospitals, academic research labs and

pharmaceutical companies can be viewed as coupled together.[6] Discussing a collection of papers on the history of reproductive biology, Gaudillière identifies the emergence of 'a middle ground' between agriculture and medicine, where scientists pursued hybrid careers and technologies, tools, artefacts, ways of doing science, and data were traded and exchanged between different parts of culture.[7] Many of the processes discussed in the set of papers Gaudillière analyses happened during wartime or the early post-war era. The state had an important role to play in this emerging interstitial arena; wartime needs put questions about agricultural productivity high on the political agenda, and later continued during the post-war era as food production was deemed important for economic growth and social progress. In Great Britain and in France, issues such as national efficiency, planning and the needs of the emerging welfare state led to state-based efforts to plan agriculture in the areas of industrial husbandry.[8] 'General factors like the changing status of the state, the growth of its regulatory powers and interests in welfare and social policies' were factors behind the changing status of agricultural sciences.[9] Summing up, Gaudilliére points to three main actors in reproductive medicine during the period 1945–1975: state, scientists and agro-business, whereas for the post-1975 period, the three main actors identified are agro-business, innovative firms and consumers, indicating an increase in citizen and consumer participation.

When it comes to the food system, recent work on the history of the 20th century shows that policy making and regulation are a very complex system with a wide range of actors.[10] These actors were obviously linked in one way or another, and it is the starting-point of this paper that 'middle grounds', similar to what Gaudillière has discussed in the agricultural sciences, also were of importance in the Swedish food system. Another similarity is a central role for the state; in a welfare state, the provision of healthy foodstuffs is important for welfare and the general well-being of the population, areas that of course were receiving attention from the Swedish state. In this article, various examples of strong-state initiative and 'middle grounds', where actors from various sectors of the Swedish food system met, will be discussed. Although food is something that is consumed and decided upon by individuals in the privacy of their own home, large-scale, techno-scientific structures and systems of regulation played roles.

## Research for a Modernized Swedish Welfare State

Most women's organizations, with as well as without direct links to specific political parties, argued during the 1930s and 1940s for increased rationalization of domestic labour. In Sweden as in other countries, interest in industrial organization had been lively during the inter-war period, and this movement for a more rational organization of industry also affected the home.[11] Crises in Swedish society – the economic depression during the early 1930s with high unemployment, as well as what was discussed as a population crisis – also led to arguments about the need for modernizing the country. Leading ideological debaters, such as Alva and Gunnar Myrdal, argued about the need for rationalization, and Swedish debaters sometimes framed their ideas as visions about a more rational society, a future society where housework was rationally organized, people were clean and healthy, and lived in hygienic housing.[12]

When the Second World War broke out, Sweden had, thus, already been thinking about crises and various technical and rational ways of handling them for quite some time. Housework became a political issue and rationalization of such work was on the whole seen as something positive, not least in the women's organizations. Some wanted women to stay at home, not competing with men in the job market but instead working in a reformed and more advanced domestic labour sector; some wanted women to take more part in the labour market outside homes: both sides could argue about the need for a more rational and time-effective organization of work in the individual home. Home economics and an institute conducting research into domestic science looked like a solution. Organizations for housewives and home economics teachers played important roles in getting such an institute started, and groups from various parts of society – housing experts, representatives from bodies working on industrial rationalization – were called upon to plan such an institute. With funding from private individuals, corporations as well as the state, Hemmens forskningsinstitut, HFI (The Home Research Institute), was inaugurated in April 1944. Key people behind this process, such as Brita Åkerman, had networks that spanned the public and the private; such networking people were often of importance in Swedish science and technology policy. HFI carried out technical work, often related to rationalizing domestic work: time studies, studies on appliances and domestic technologies, methods of working. Committees of housewives were organized, where women tested kitchen tools and appliances; the Institute's cooperation with industry would, it was hoped, lead to products being influenced during the design phase, before they reached the market. Pedagogical projects were launched: HFI and home economists were in contact with companies in the food sector such as ICA and the

cooperatively owned retailers KF, issued films and books and held courses aimed at housewives so as to improve their daily work routines. Regulation when it comes to home design, norms and standards for designing kitchens were produced by work done at HFI. Some of these norms are still of importance in Swedish architecture.[13]

## Research Policy and Organization: State-Industry Collaboration

Financed jointly by government grants and the private sector, HFI was placed as a private-public intermediary organization. Boundary organizations were not unusual features of the landscape of 20th century Swedish science and technology, and had been so for quite some time, often with the Swedish Academy of Engineering Sciences as a facilitator of such research collaboration across the state-industry divide.[14] HFI was not the only one of importance for food-related technologies. While HFI worked vis-à-vis consumers with a collaboration between organizations representing consumers and industry and state bodies, another institute came into being with the express purpose to connect the food technology industry with academic scientists working on food technology: Svenska institutet för konserveringsforskning, SIK (The Swedish Institute for Food Preservation Research).

The immediate background to SIK was a government committee with the aim of proposing new ways of organizing and financing research in science and technology, established in 1940 under the chairmanship of industrialist Gösta Malm. Science, state and industry joined forces; representatives from industry and the science-engineering community played important roles in establishing the committee's goals and membership. Interest groups connected with industry and technology played significant parts in getting the committee going.[15] Staffed with central research policy actors such as Edy Velander and the Nobel laureate The Svedberg, in addition to specialists from industry and science in various subcommittees, it worked for several years and produced a number of reports that became of some importance in a re-arrangement of the Swedish research system.

It is perhaps telling that the food sector was singled out as one of the areas deemed worthy of attention when the Malm Committee surveyed the Swedish research landscape in the 1940s. The Committee issued a report in 1945 that analysed the food technology sector. Important parts of the report had been written by Henry Brahmer, an engineer working at Svenska

jästfabriks AB – a company with a virtual monopoly of the Swedish yeast market – and active in several state committees on questions pertaining to the chemistry industry.[16] Besides Brahmer, significant parts of the report were written by Edy Velander, professor and director of the Royal Swedish Academy of Engineering Sciences (IVA); Velander was something of a key figure in IVA's activities as facilitator of heterogeneous research collaborations in Sweden during the early post-war period. Velander had spent half a year during the war at the Swedish legation in Washington and had there been able to study the organization of food technology research. Also, contacts with the food industry were established when the Malm Committee held a number of conferences with representatives from the industry and academia, and the industry formed a delegation that had as a goal to confer with the Committee. The goal was to reach common understanding among groups of stakeholders, at least in the industry. The state, industry and academia were to collaborate in the food-related sector, both during the work of the Malm Committee and later.

In the report, a rather bleak picture was painted. It depicted a sector that, while of huge importance for Sweden, was lacking in the area of innovation and technological developments: much more could be done in food technology. The level of patenting was low and if any food technology development took place, it often involved a risky dependency on foreign knowledge. A proposed state-funded institute of food technology, if such was ever to be financed by the state, had to bring a return on investments, from society's point of view; no illusions about the pursuit of science for the lofty goals of knowledge as a value in itself could be held by those who read the report; an institute for research in food technologies would only be financed if it could be shown that society would gain financially from such an endeavour; funding for research was seen as investments that had to be balanced by economic gains, society-wide.[17]

The ideas about an institute aimed at food preservation research met with approval. As director of the institute Georg Borgström was chosen, a botanist who, after his PhD thesis was defended at Lund University in 1938, had been working at Institutet för växtforskning och kyllagring, IVK (The Institute for Plant Research and Cold Storage). A private research institute, formed in 1942 by the Swedish shipping company Rederi AB Nordstjernan, IVK's goal was to promote the export and import of Swedish agricultural products, especially trade with South America, by research conducted by scientists at the Institute. The Institute had a

number of biologists on its payroll.[18] It was one of the many institutional milieux where scientists worked for shorter or longer periods outside of academia proper.

Activities at the Swedish Institute for Food Preservation Research soon were on a rather large scale. Besides Borgström, the Institute employed staff working in biochemistry, microbiology, chemistry, physical chemistry, process engineering, package engineering, cooking and so on. It was jointly financed by the state and the industry (via a foundation that a number of companies in the food industry had formed), to this came temporary grants from several state research councils.[19] SIK worked on a number of technical issues regarding several kinds of conservation technologies, both established technologies and more future-oriented, such as irradiation.[20]

SIK was formed in an era with ideas about the need for industry-state sponsored research, aimed at producing industrially relevant research results. But how did it live up to this ideal of heterogeneous collaboration? Different preservation methods – canning, drying, freezing as well as irradiation and other methods that lay in the future – each represented various industrial interests. The choice of which of these SIK studied could be seen as representing support for a part of the food sector, or even a single company. Daily scientific work at SIK's laboratories could therefore be coupled together with industrial interests. When, in the mid-1950s, a controversy erupted surrounding Borgström, these various interests became visible. Borgström had, besides working as a food technology scientist and director of SIK, begun a career as a very visible person in the debate concerning global resource allocation issues, world poverty and starvation.[21] His many public engagements, especially since *Jorden – vårt öde: Kan en permanent världshunger avvärjas* had been published in 1953, hampered the work the companies thought they paid Borgström to do. One such opinion was put forward by the canning company PLM's Director Knut Laurin, who was on the board of SIK, during the autumn of 1953. Borgström received support from Edy Velander and other academics. After the fight had reached epic proportions and became publicly visible, Borgström in the end left Sweden for a post as professor of food technology at Michigan State University in 1956.

Björn-Ola Linnér has studied this controversy in detail.[22] What is of interest here is that the cooperation between industry and academic research that was an ideology behind the industrial research institutes did not always lead to the kind of harmonious coexistence between industry and state for the good of the whole of society that was the ideology behind

the institutes. The example shows that the boundary organisations in a heterogeneous research landscape do not always work as intended as brokers between different actors and as facilitators of cross-cultural exchange, but could rather be sites of conflict. The conflict led to a public debate about the freedom of research and possible problems for such freedoms, because of an increased cooperation between industry and academia.

Borgström's view of the debate was not that he had abused his post as director of SIK, but rather that PLM, a leading Swedish company in the canning business, had opposed SIK's and Borgström's work on developing deep freeze technologies; PLM (as well as the state) had thus been financing a rival technology and PLM's competitors in the marketplace.[23] Conflict surrounding targeted research and development efforts need not only be a conflict between pure science and industry in general, but can also emanate from discontented market actors when they perceive state-run efforts as skewed.

Besides research on various technologies for conservation, SIK also functioned as a communication platform and a communicative boundary organisation between the world of international food technology and the Swedish food industry. The Institute kept an eye on how food technologies were presented in the Swedish media. SIK and Borgström published books about how to handle various kinds of foodstuffs, for example *Fryskonservering* which was presented as a 'practical guide to deep freeze preservation of all kinds of food for homes, schools and freeze locker plants. The book also deals with the principles of freeze technologies and the scientific development that lies behind'.[24] SIK published *Livsmedelsteknik: Tidskrift för livsmedelsförädling och näringsfrågor*, launched in 1953 with Edy Velander as publisher and with an editorial board with a strong emphasis on academics. The publication belonged to SIK and the Academy of Engineering Sciences and had as a goal that 'the thousands of people who in their work deal with food, its production processing, distribution and retailing will be kept informed of the current status of science and technology in this field'; it wanted to 'be a journal for industrial food processing and nutritional issues, therefore be a forum for the whole of the food technology sector. It is especially aimed at professionals in the sector and at those who work in education'.[25] Advertisements in the journal promised modernity for the food sector; food is presented here not as something you enjoy but rather as producing food on an industrial scale.

## Frozen Food

Organizations such as HFI and SIK were supplemented by other kinds of milieux where parts of the food sector met to gather information, collaborate on standards development, and even drive regulative processes forward. Taking frozen food technologies as an example, a part of food technology that was in rapid development during the immediate post-war period and with many links to electric energy systems, food distribution, public health, security, etc., we will look at how industry representatives, state regulatory bodies, academic researchers, politicians and others met via various trade organizations and publications to debate policy issues, prepare regulation and pursue knowledge development.

Being a rather new technology, it was an area where future prospects were often discussed and countries, notably the US, which were ahead of Sweden, were watched with close interest by the scientists and industrial representatives who formed part of the policy-making community in this part of the Swedish economy and technology. It was also a technology with considerable incentives for industry-academic relationships, as exemplified by Matts Bäckström. He published the widely used textbook *Kylteknikern* and was a vocal person in the Swedish Society of Refrigeration. His professorial chair at the Royal Institute of Technology (KTH) was financed by Electrolux, the leading Swedish firm in the sector.

Kyltekniska föreningen (The Swedish Society of Refrigeration), an organization formed in 1942 with the aim to promote freezing and related technologies, can be seen as one of the platforms used by various actors in the cooling sector when they tried to work out policies that were of importance for the development of the freezing technologies. It was linked to major industrial as well as academic actors (and also state bodies) from the start.[26] Looser in form than an institute or a state regulatory body, it still organized significant activities in regulation concerning this food technology.

The Swedish Society of Refrigeration was founded in a spirit of political awareness; it was presented as a platform for experts who were to play a part in the development of society; the cooling engineers claimed that their technology was of immense importance for Sweden's present and future, in terms both of economic welfare and public health.[27] An articulated goal for the publication was that, at the same time as it published purely technical texts, it would

also work for public enlightenment for the benefit of both individuals and society at large, by spreading the gospel about a technology that was purely good.[28]

Regulation for cold storage and frozen food technologies was done not by the state exclusively but in cooperation with bodies such as IVA and Kyltekniska föreningen.[29] The Swedish Society of Refrigeration sometimes organized discussions and analysis of the international literature on cold storage regulation. One such regulatory process had, first, Professor Bäckström issue a summary of international work in the field of cold storage. At the time, many of the guidelines and regulations about how long and at what temperatures various foodstuffs could be stored, before they were degraded, were just emerging, rather than finished. This was then followed by a public meeting, organized by the Society with representatives from science as well as several companies in the food sector, both manufacturers of cooling equipment and in the food retail sector, plus representatives from an institute of consumers.[30]

## Welfare and Warfare, Security and the State

The Malm Committee report on the need for state support of innovation in the food technology sector positioned the food sector in a national and a welfare-society perspective. Workers' health and public health in more general terms were seen as emanating from the quality of foodstuffs; better food, prepared by a more research-oriented food technology than before, would lead to a healthier Swedish population. In this, the Malm report paralleled other attempts at improving public health through the combination of nutritional science and social policy.[31] In a welfare state, this, the report noted, also had an economic side to it: public spending on healthcare was used to take care of illnesses that otherwise 'could have been avoided, if the food sector had been organized according to modern nutritional and physiological principles'.[32] The Malm Committee report on the organization of food technology research was somewhat sceptical about the ultimate success of efforts to heighten the consumer awareness about eating healthier by information campaigns. The goal – a healthy Swedish population that via food received the necessary nutritious foodstuffs – would be reached faster if the pedagogical attempts aimed at housewives would be supplanted by the creation of a domestic food technology industry with high-quality products based on scientific results. Industrially produced food could be filled with nutritious elements according to

physiology's latest findings. The arrival of SIK can therefore be seen as supplanting other attempts at raising the awareness of Swedish consumers.[33]

The report of the Malm Committee with regards to the food technology sector also studied the handling of foodstuffs in people's homes. The amount of time spent by Swedes in their kitchens was estimated at up to 200 million days' work per year. Rationalization of this work could lead to large savings for society as a whole. The goal, according to the report, was for the food industry to develop preserved food that was better, easier to cook and cheaper than the food prepared by housewives; such development could be produced only on the basis of 'techno-scientific research, centralized and lavishly supported by the state as a spokesman for that broad group of consumers, the housewives'.[34] The report did not anticipate a significant and direct involvement of consumers in the development of food technologies; the ideas of the report were rather those of a state- and industry-driven regulation and development.

Public health issues and the then current debates about the workforce and women's place in society were a central part of the report, which saw the proposed institute as being 'a kind of intermediary step between the producers of raw material for cooking and the consumer of food', the consumers in this case also included specialists working on food in the army and similar organizations. In the report, individual consumers' wishes ought rather to appear via intermediaries such as retailers; the individual consumer was kept at a distance, the communication was done via intermediary organizations. To further point at the proposed institute's identity as a kind of boundary organization, the report proposed that the institute would cooperate with a range of specialists, research administrators, scientists and research funding agencies within nutritional physiology, genetics, agriculture, technology, medicine, Statens institut för folkhälsa (The Institute for Public Health), Fackskolan för huslig ekonomi (The School of Home Economics) and HFI.[35]

War preparations and the security issues also figured in the report of the Malm Committee. The report explicitly mentioned food as a strategic resource: in times of war, it would be very important for Sweden if food could be produced domestically. A third of the country's food supply was in one way or another dependent on international trade, which was not satisfactory from a security point of view, 'since it was important for every nation, and for the feeling of safety and independence, that food could be produced with own means in sufficient quantity and of a good enough quality'.[36] The Swedish food sector was seen as a strategic domestic

industry that, for the Swedes, had a bearing on the important question of neutrality. This was an issue that would remain important as the Second World War gave way to the Cold War.

The development of Swedish deep freeze plants posed a possible security problem for Sweden in the event of war. Cold storage facilities were built close to urban areas, which could be a risk in times of war, since ammonia and other dangerous substances used in the plants would be emitted in the case of a bombing attack.[37] Arguments were made, for example by Sven Sjöholm, director of Statens livsmedelskommission (The State Board for Food Planning), for a more widely geographic distribution of cooling plants and for keeping plants of a moderate size, thus lessening risks of disruption in the food supply during wartime. Here, lessons from the ongoing WWII were applied by Sjöholm for the future.[38]

As ammonia was being phased out as a cooling agent in cooling appliances and new products such as Freon were being introduced instead, other problems arose. Wartime disruptions to normal trade patterns could lead to a lack of Freon for the Swedish cooling industry. The cooling technology community tried to deal with the problem by calling for discussions between the proper authority for such national security questions, riksnämnden för ekonomisk försvarsberedskap (The National Committee for Economic Military Preparedness), with the possible addition of representatives from arméförvaltningen (the Army), civilförsvarsstyrelsen (The Civil Defence Board) or centrala sjukvårdsbyrån (The Central Health Care Board).[39] To counter the insecurity in times of war, a Swedish production of Freon was discussed; not an easy problem to solve as, according to Matts Bäckström, a preliminary Swedish production during the Second World War had run into technical difficulties.[40] As a possible alternative, the development of a system of emergency stockpiles was discussed, a solution used in other strategic sectors in Sweden during the Cold War; especially oil was stockpiled in a large-scale nationwide system of mountain depots. [41]

## International Perspectives

While pursuing nationally-oriented goals, the food technologists were also looking abroad. Especially the US was a source of inspiration for much of the food technology-oriented development during WWII and after, but also Germany was interesting.[42] The report from the Malm Committee that led to the founding of SIK saw the US as a forerunner in the fields of research within food and preservation technologies. Edy Velander's US visit in 1944 led to an

appendix to the report, in which Velander stated how many leading American companies had joined together in a foundation that financed academic research in the fields of food technologies. And just four years later, right after SIK had been founded, one of Borgström's first tasks as leader of SIK was to make a study trip to the US.[43] Bo Pierre, Bäckström's assistant at the Institute of Cooling Technology at KTH, also made a study trip to the US at about the same time.[44] Several groups of European experts, among them some Swedes, were touring the US food industry to learn more about American frozen food technologies, food research, etc.[45]

The US was earlier than Sweden in adopting freezers. Initially positioned as a luxury product, the mass marketing of frozen foods was developing from the late 1940s, and frozen foods expanded in volume. New business ideas and technological developments played a role, as did freezers in individual American homes and a boom in supermarkets in the suburban settings that were spreading across the US. The products were marketed with arguments about convenience and good quality, while keeping the prices low; other attempts at convincing customers hinged on the nutritional values of frozen foods.[46] Swedish visitors returning from the US brought home enthusiastic reports about American developments in the freezing technologies.[47] Before embarking on a large-scale development of new food technologies, looking at what had happened in a country, such as the US, that was ahead of Sweden made sense. For example, American experience when it came to the choice of locker plants versus home freezers was of interest for Swedish food technologists.[48] Sometimes, American visitors came to Sweden to discuss the present and future state of freezing technologies in the US, such as when IVA in 1948, with support from the Technical Research Council (TFR) organized a speech by Aksel G. Olsen, director of applied research at General Foods Corporation. Future projections were one genre of policy debate in the food technologies literature. Olsen told a story about locker plants; large information campaigns aimed at teaching housewives how to use home-freezers; the serving of whole and complete meals that were deep-frozen and later defrosted in a microwave oven, pioneered by Eastern Airlines and Raytheon Manufacturing Company; marketing of frozen orange juice concentrate; work at the Massachusetts Institute of Technology (MIT) on the killing of bacteria by exposure to ultra-short wave radiation; the potential of using X-rays for sterilizing, etcetera – America was here portrayed as a food technology futurama.[49] The use of freeze technologies in Sweden could also be something of a model for some countries, for example Finland.[50]

IVA sometimes organized international visits. When a delegation from the European Productivity Agency (EPA), a body within the Organisation for European Economic Co-operation, in the mid-1950s toured the Swedish food technology system, the visit was organized by IVA. Sites visited by the European experts were, among other Swedish institutions, SIK, IVK, and the Department of Cooling Technology at KTH.[51]

## Concluding Remarks

Even though Georg Borgström was complaining about a lack of status, 'respect' and resources for the food technology sector, in an era that put increasing emphasis on rockets, atoms and fighter aeroplanes, the Swedish state and Swedish companies nevertheless made a number of attempts to increase the sector's visibility and the availability of its findings. Food technology was seen by state representatives, politicians and companies alike as a central sector of the economy.

The state was as a strong actor initiating various activities in the food sector. It is, however, worth noting the fact that various stakeholder interests also were active in a kind of state-industry cooperation that seems to have permeated the policy cultures in science and technology. Both 'for public provision of food at large as well as for the economy of the companies in question, it is imperative that the optimal ways of [handling frozen food] are being thoroughly researched and the results quickly put to practical use'.[52] Such were the views, held not only by Hugo Fredholm at the laboratory run by Sveriges slakteriförbund (The Swedish Farmers' Meat Marketing Association), it was a general idea: the state and companies had a joint mission. In the food sector, companies and state initiative were mainly aligned and allied. The food sector had a bearing on welfare as well as warfare. Thus, it linked to anxieties felt society-wide about safety during the Cold War, as well as to the public health projects during a period in Sweden's history when strong state initiatives were important. Food technologists, scientists and other experts in state, industry and research saw food and the technologies for preserving, transporting, storing and distributing food as a vital and strategic resource both for Sweden's possibilities for societal development in peacetime and its ability to survive a future war. Food was a strategic resource for a neutral welfare state.

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[1] William Gibson, *All Tomorrow's Parties* (1999; 2nd edn., London, 2000), 213.

[2] 'Atomer, föda och folkupplysning', *Livsmedelsteknik*, 3, No. 5 (1955), 138.

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[4] Daniel S. Greenberg, *Science, Money, and Politics: Political Triumph and Ethical Erosion* (Chicago & London, 2001).

[5] Joan H. Fujimura, 'Crafting Science: Standardized Packages, Boundary Objects, and "Translation"', in *Science as Practice and Culture*, ed. Andrew Pickering (Chicago, 1992); Peter L. Galison, *Image and Logic: A Material Culture of Microphysics* (Chicago, 1997); David H. Guston, 'Boundary Organizations in Environmental Policy and Science: An Introduction', *Science, Technology, and Human Values*, 26 (2001), 399–408; David H. Guston, 'Stabilizing the Boundary Between US Politics and Science: The Role of the Office of Technology Transfer as a Boundary Organization', *Social Studies of Science*, 29 (1999), 87–111. The list of concepts could be made longer.

[6] Jean-Paul Gaudillière, 'Biologists at Work: Experimental Practices in the Twentieth-Century Life Sciences', in *Companion to Science in the Twentieth Century*, eds. John Krige and Dominique Pestre (London, 2003).

[7] Jean-Paul Gaudillière, 'The Farm and the Clinic: An Inquiry into the Making of Our Biotechnological Modernity', *Studies in History and Philosophy of Biological and Biomedical Sciences*, 38 (2007), 521–9.

[8] Ibid., 524 f.

[9] Ibid., 526.

[10] David F. Smith and Jim Phillips, 'Food Policy and Regulation: A Multiplicity of Actors and Experts', in *Food, Science, Policy and Regulation in the Twentieth Century*, eds. David F. Smith and Jim Phillips (London & New York, 2000).

[11] Hans De Geer, *Rationaliseringsrörelsen i Sverige: Effektivitetsidéer och socialt ansvar under mellankrigstiden* (Stockholm, 1978).

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[13] Boel Berner, *Sakernas tillstånd: Kön, klass, teknisk expertis* (Stockholm, 1996), Chapter 4; Britta Lövgren, *Hemarbete som politik: Diskussioner om hemarbete, Sverige 1930-1940-talen, och tillkomsten av Hemmens Forskningsinstitut* (Stockholm, 1993).

[14] Thomas Kaiserfeld, this volume.

[15] Thorsten Nybom, 'The Socialization of Science: Technical Research and the Natural Sciences in Swedish Research Policy in the 1930s and 1940s', in *Center on the Periphery: Historical Aspects of 20th-Century Swedish Physics*, ed. Svante Lindqvist (Canton, MA, 1993); Hans Weinberger, *Nätverksentreprenören: En historia om teknisk forskning och industriellt utvecklingsarbete från den Malmska utredningen till Styrelsen för teknisk utveckling* (Stockholm, 1997).

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[17] *Utredning rörande den tekniskt-vetenskapliga forskningens ordnande. VII. Förslag till åtgärder för livsmedelsforskningens ordnande*, *SOU 1945:6*, 15.

[18] Nils Gustafsson, *IVK 1942-1992: 50 års verksamhet i potatisodlingens tjänst vid Institutet för växtforskning och kyllagring och IVK potatis AB* (Umeå, 1995).

[19] Yearly report of SIK 1952–1957, *SIK-rappport*, Nos. 87, 105, 114, 122, 129.

[20] Some examples are discussed in Gustav Holmberg, 'Vetenskap och livsmedelsindustri: Svenska institutet för konserveringsforskning', *Lychnos: årsbok för idé- och lärdomshistoria*, (2005), 199–218.

[21] Björn-Ola Linnér, *The World Household: Georg Borgström and the Postwar Population-Resource Crisis* (Linköping, 1998).

[22] Ibid., 165–81.

[23] Ibid., 171.

[24] Advert in *Livsmedelsteknik*, 1 (1954), 12.

[25] 'Anmälan', *Livsmedelsteknik*, No. 1 (1953).

[26] For example, a list of supporters who financed activities in the beginning of the Society included the noted industrialist Axel Ax:son Johnsson as well as major companies in the food sector.

[27] 'Anmälan', *Kylteknisk tidskrift*, 1, No. 1 (1942), 1–2.

[28] Stig Kuhlemann, 'Några allmänna synpunkter på kyltekniken och denna tidskrifts mål och syften', *Kylteknisk tidskrift*, No. 2 (1942), 1.

[29] Vilhelm Bödcher, 'Kommentarer till IVA:s säkerhetsanvisningar för installation och skötsel av industriella kylanläggningar', *Kylteknisk tidskrift*, No. 11 (1942), 87–8: 'IVA:s skrivelse till Kungl. Maj:t i samband med "säkerhetsanvisningarnas" överlämnande', *Kylteknisk tidskrift*, No. 12 (1942), 100.

[30] Matts Bäckström, 'Frysta varors lagringstemperatur', *Kylteknisk tidskrift*, No. 5 (1956), 55–8; 'Lagrings- och transporttemperaturer för frysta varor: Diskussionssammanträdet med Svenska Kyltekniska Föreningen den 26 oktober 1956', *Kylteknisk tidskrift*, No. 1 (1957), 1–10.

[31] Roger Qvarsell, 'Maten och vetenskapen: Näringslära, kostvanestudier och socialpolitik, ca 1880-1960', *Lychnos*, (2005), 219-244

[32] *Utredning rörande den tekniskt-vetenskapliga forskningens ordnande. VII. Förslag till åtgärder för livsmedelsforskningens ordnande*, 65.

[33] Berner, *Sakernas tillstånd: Kön, klass, teknisk expertis*, Chapter Four.

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[35] Ibid., 77 f.

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[37] Gustaf Seth, 'Kylanläggningar och luftskyddet', *Kylteknisk tidskrift*, No. 6 (1942), 45–7.

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[39] 'Kyltekniska samarbetsorganet', *Kylteknisk tidskrift*, No. 6 (1954), 92 f.

[40] 'Kyltekniska samarbetsorganet', *Kylteknisk tidskrift*, No. 6 (1955), 86.

[41] A process of phasing out the oil stockpiles was initiated in the 1990s. The Swedish Geological Survey was given the responsibility to clean up the large depositories that had housed Sweden's strategic oil reserve; what had once been a part of national security had now become more of an environmental problem. <http://www.sgu.se/sgu/sv/samhalle/miljo/avveckling/index.html>, accessed 21 August 2007.

[42] See, for example, the article about an institute for food research opened in Munich during WWII. Lorens Rasmusson, 'Livsmedelsforskning', *Kylteknisk tidskrift*, No. 10 (1944), 127–34.

[43] Georg Borgström, *Från USA:s konservindustri och konserveringsforskning: En studieresa sommaren 1948*, Vol. 1, *SIK-publikation* (1948).

[44] 'Review of Bo Pierre, Amerikansk kylteknik', *Kylteknisk tidskrift*, No. 3 (1950).

[45] Baltzar Jacobsson, 'Från en studieresa i USA år 1950', *Kylteknisk tidskrift*, (1951), 37–9; *The Cold Chain in the U.S.A. Report of a Group of European Experts*, *2 vols.* (1951).

[46] Shane Hamilton, 'The Economies and Conveniences of Modern-Day Living: Frozen Foods and Mass Marketing, 1945–1965', *Business History Review*, 77 (2003), 33–60.

[47] T. Elfving, 'Nytt amerikanskt system för distribution av frysvaror', *Kylteknisk tidskrift*, No. 8 (1946), 45–7.

[48] Georg Borgström, 'Köldfacksutvecklingen i USA', *Kylteknisk tidskrift*, No. 2 (1952).

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[50] Mika Pantzar, 'What Do We Need a Freezer for? – The Social Construction of the Freezer Use(r) in Finland from the 1950s to the 1980s', conference paper presented at the conference Consumption, Everyday Life and Sustainability, Lancaster University, 27–29 March 1998, available online at <http://web.archive.org/web/20010306040744/www.lancs.ac.uk/users/scistud/esf/pantz.htm>.

[51] *Kylteknisk tidskrift*, August 1955, 46; *Kylteknisk tidskrift*, April 1955, 25.

[52] Hugo Fredholm, 'Kylhuslagring och snabbfrysning av slakteriprodukter', *Kylteknisk tidskrift*, No. 11 (1943), 91–4.

[53] Gustav Holmberg, 'Vetenskap och livsmedelsindustri: Svenska institutet för konserveringsforskning', *Lychnos*, 2005.