English summary

The Nobel Prize Career of Ragnar Granit. A Study of the Prizes of Science and the Science of the Prizes

This study is concerned with two closely related themes: the reward system of science – i.e. the various means by which scientists express their admiration and esteem for their colleagues – and the role played by social networks within this broader framework. The study approaches its topic from the viewpoint of the Nobel Prize for Physiology or Medicine, often referred to as the Nobel Prize in Medicine. The focus of the study is on the lengthy process that led to the granting of the 1967 Nobel Prize to Ragnar Granit (1901–1991) for his discoveries concerning the primary physiological visual processes in the eye. His award was preceded by one of the most dramatic conflicts within the prize authorities during the post-war decades, and serves here to illustrate the dynamics and the various strategies employed in the Nobel Committee of the Karolinska Institute. In addition, Granit's career as a Nobel Prize candidate is used as a window through which it is possible to examine the various ways in which elite networks in the scientific field operate. In order to enable comparison, the Nobel careers of Charles Best, Hugo Theorell, and John Eccles are also discussed. On a more general level the Nobel careers of other scientists who received the Nobel Prize in Physiology or Medicine in the period 1940–1960 are also discussed, whereby, as an offshoot of the study, a general picture of the Nobel institution in the post-war decades emerges.

Chapter 1 is an introduction discussing the earlier literature on the Nobel institution and the sources used in the study: the documents of the Nobel Committee of the Karolinska Institute and Granit's scientific correspondence. Access to the Nobel material is restrict-

ed to documents older than 50 years, thereby making it impossible to cover the final years of Granit's career as a Nobel candidate relying on archival sources. Since the primarily purpose of my study is not to present a comprehensive account of Granit's career culminating in the Nobel Prize but rather to uncover the underlying mechanisms by which networks operate with regard to prizes for science, the non-availability of archival sources is not, however, irremediable. Moreover, the main features of the final part of Granit's career as a Nobel candidate can be reconstructed on the basis of his correspondence, containing over 9400 letters from the years 1922–1968.

Chapter 2 presents the theoretical tools employed in the study: field, scientific and social capital, network, social ties and gift. A Field, as defined by Pierre Bourdieu, is an autonomous or relatively autonomous social arena in which social actors manoeuvre and struggle over the appropriation of certain capitals (social, economic and cultural etc.). By scientific capital I refer to a certain subspecies of symbolic capital that is seen as significant in the scientific field. In other words, scientific capital is a resource possessed by an actor and conferred on him by his/her peers by reason of honour, prestige and recognition. By social capital, in turn, I refer to a set of informal and formal social connections between various actors. While for Bourdieu social capital is essentially an individual resource, in Robert Putnam's and James Coleman's view it is seen as a collective resource or, rather, an attribute of collectives, the focus being on the social norms and trust that generate social capital. These two approaches are often represented as incompatible, but in this study they are brought together within a larger framework to illustrate the various roles of the social networks play within the reward system of science.

In colloquial speech, however, people do not talk of social capital, but of social ties or networks. In its simplest form, a social network is a structure made up of a set of individuals, connected to each other by specific types of ties. It is a rather ambiguous term, and, along with social capital, lends itself to multiple definitions. In this study, network is used as a generic term to describe different sets of indi-

viduals, whereas strong, weak, and absent ties – all terms coined by the sociologist Mark Granovetter – are used to qualitatively distinguish between different kinds of interpersonal relationships. Finally, by gift I refer to a term coined by Marcel Mauss in his classic work of the same name. According to Mauss, gifts are never "free" but, rather, initiate reciprocal exchange. More precisely, gifts create and uphold cohesion and a sense of solidarity, a process which in this study is analysed in terms of scientific prizes, honours and other distinctions actors in the scientific field confer on each other as an expression of admiration and friendship.

Chapter 3 discusses the nomination process for the Nobel Prize in Physiology or Medicine and the various explicit and implicit criteria that govern the selection of the Nobel laureates. The chapter also includes a statistical account of the nominations and candidates for the Nobel Prize in Physiology or Medicine in the period 1901–1960, while the final part of the chapter enlarges upon the notion of Nobel career, a term referring to a process that starts with the first nomination for a given candidate and ends either with the last nomination or, in a few cases, with the awarding of the Prize.

Drawing on correspondence and other archival sources, Chapter 4 aims at providing an overview of the scientific career and networks of Ragnar Granit. He was born in 1900 in Riihimäki, Finland, but spent his childhood in the parish of Helsinki. He studied psychology and medicine at the University of Helsinki and received the degree of Doctor of Medicine and Surgery in 1927. In 1928 he went to pursue his studies with Sir Charles Sherrington, co-recipient of the 1932 Nobel Prize in Physiology or Medicine and by far the most prominent authority of his time on the central nervous system. In 1929–1931 Granit worked at the Johnson Foundation of the University of Philadelphia, at that time the world's leading centre for vision research, and in 1932–1933 he resumed his work in Sherrington's laboratory as a Fellow of the Rockefeller Foundation.

After having declined a chair in physiology in Tartu, Estonia, Granit accepted the chair in physiology at Helsinki in 1935, a post

to which he was formally appointed in 1937. However, dissatisfied with his working conditions, Granit started to look farther afield in the hope of securing an institute of his own. He had, in fact, as early as in 1934 made an attempt to move to Oxford, and in 1938 he considered applying for a chair in physiology that was about to fall vacant at Uppsala, Sweden. Both efforts came to nothing, but as dark clouds loomed on the Finnish horizon in the summer of 1939, Granit received news from Harvard that he was likely to be offered a chair in ophthalmology and a research institute of his own. Faced with the possibility of losing one of Scandinavia's leading scientific figures, Carl Gustaf Bernhard, Granit's Swedish pupil, proposed the establishment of a neurophysiologic research laboratory for Granit at the Karolinska Institute. When the Soviet Union attacked Finland in November 1939, the arrangements for inviting Granit to Stockholm were already underway.

After the war, Granit received an official invitation from Harvard, followed by an invitation to take up a chair in neurophysiology at the Karolinska Institute. Hesitating between the two offers he finally decided in favour of Stockholm, an offer which not only allowed him to stay close to his native Finland and his summer place in Korppoo but also provided an opportunity to expand his research agenda outside the field of vision research. In 1945 Granit's laboratory was made a department of the Medical Nobel Institute, and the following year Granit was granted a personal chair in Neurophysiology. During the post-war years his Nobel Institute developed into one of the foremost neurophysiologic research institutes in the world and attracted a great number of visiting scholars especially from the United States, England and Germany. Granit retired in 1967, but continued to serve as a visiting professor or researcher e.g. at Oxford and at the National Institute of Health, Bethesda, USA.

From the beginning of his career, Granit was strongly attracted to the study of colour vision, at first with psychophysical methods and, by the mid 1920's, with a physiological approach. The beginning of the 1930's saw the appearance of his first important publications, in-

cluding his pioneering work on the electroretinogram (ERG) and the seminal paper co-authored with Per-Olof Therman where he demonstrated that retinal cells could both inhibit and stimulate impulses. In 1939 Granit and Gunnar Svaetichin demonstrated that the electrical impulse sensitivity of the eye was divided into three different groups in the areas of blue, green and red. After his move to Stockholm, Granit formulated his dominator-modulator theory of colour vision, based on his studies on the action potentials of single optic nerve fibres. The theory claimed that in addition to three kinds of photosensitive cones – the colour receptors in the retina – there are some optic nerve fibres (dominators) that are sensitive to the whole spectrum of light, whereas others (modulators) only respond to a narrow band of wavelengths. Granit's book Sensory Mechanism of the Retina, published in 1947 (but finished as early as 1943), summarized the results of his visual work and became a modern classic in the field of electrophysiology and vision research. While Granit is remembered chiefly for his contribution to visual research, in the latter half of the 1940's he turned his attention to the problems of motor control, becoming one of the main authorities in this field as well. However, his Nobel Prize, which he received immediately after his retirement, was awarded for the analysis of the internal electrical changes that take place when the eye is exposed to light.

Chapters 5 and 6 then address the dramatic and in many respects unusual process resulting in the 1967 Nobel in Physiology and Medicine being awarded to Granit. He was first nominated in 1946 for his studies on the retina and would thereafter be nominated practically every year, amounting to a total of 24 nominations from 23 different nominators in 1946-1960. Already in 1946 Granit appears to have been a serious candidate. His colleagues, the powerful secretary of the Nobel Committee Göran Liljestrand, professor of physiology Ulf von Euler and neurophysiologist Yngve Zotterman supported him in the committee, and the two latter also took turns in writing expert reports on his merits. The Committee considered him worthy of the prize, and in 1947 as many as half of the Committee members were

of opinion that the Prize should be awarded to Granit. Since proposing a professor of the Karolinska Institute without the backing of the entire Committee was likely to cause an unpleasant situation not only for the college of teachers but for Granit as well, the Committee eventually recommended that the prize be awarded to Carl and Gerty Cori and Bernardo Houssay.

Granit was also deemed worthy of the prize in 1948. However, this time his work was harshly criticised by his former associate Carl Gustaf Bernhard who, in the meanwhile, appears to have fallen out with Granit. According to Bernhard, the committee should withhold Granit's award until some of his results had been confirmed by others. In addition, Bernhard suggested that the prize, if awarded, should be divided between Granit and Haldan Hartline, who, along with Granit, had made a noteworthy contribution to the development of retinal neurophysiology. As demonstrated in the study, Bernhard's behaviour not only exacerbated the antagonism between the two but also made the question of Granit's award a rather annoying one for the whole academic community at the Karolinska institute.

The year 1949 witnessed the culmination of Granit's career as a Nobel candidate. He was put forward by three former Nobel laureates, Edgar Adrian, Charles Scott Sherrington and Bernardo Houssay, the first of whom also nominated Hartline whose nomination had been made a prerequisite for awarding the Prize to Granit. In order to respond to the critique levelled against Granit by Bernhard, his supporters in the Committee resorted to what, in all likelihood, was an unprecedented tactic: they brought in a foreign expert, Herbert Gasser, a friend of Granit and the Nobel laureate of 1944, to submit an additional report on Granit. In addition, they even proposed one of the strongest candidates for the chemistry prize in order to clear the way for Granit. However, the aggressive strategy of Granit's supporters provoked a backlash from Bernhard and the professor of chemistry at the Karolinska institute, Erik Jorpes. In a submission to the Committee these two criticised the previous report written by the professor in physiology at Lund, George Kahlson, while the latter went as far as to question the

scientific value of Granit's findings and thereby even his eligibility for the Prize. While the majority of the committee agreed on withholding the Prize, Granit's supporters contended that Granit and Hartline were worthy of the Prize. However, in the final vote the Committee eventually settled for a compromise agreeing to award the 1949 prize jointly to Walter Rudolf Hess for his discovery of the functional organization of the interbrain and Egas Moniz for his discovery of leucotomy, a psycho-chirurgic operation more commonly known as lobotomy.

By 1950, Granit's supporters had recovered from their defeat and prepared for a new offensive in the 1951 election. Granit had received four nominations, but since none of them included Hartline's name, Liljestrand intervened by submitting a nomination for Hartline, thereby making it possible to consider Granit and Hartline for a joint award. Applying the same strategy as two years earlier, Liljestrand invited a foreign expert, another friend of Granit and the Nobel laureate of 1932 Edgar Adrian, to submit an additional report on Granit. Based on the opinion of its experts, the majority of the Committee deemed Granit and Hartline worthy of Prize, but with Bernhard and some others opposed, their chances for the Prize were non-existent. Realizing that their campaign was doomed to fail his supporters retreated, while Granit was relegated to the "waiting list". He would, indeed, continue to receive nominations throughout the 1950's and on three occasions his research was subjected to a detailed investigation. However, none of these investigations resulted in the desired outcome, and, thus, Granit himself underwent a transformation from beneficiary to donor. In this capacity he was, for example, actively engaged in lobbying for a Prize for his friend and fellow renowned neurophysiologist, John Eccles, who, after a Nobel career of 10 years, shared the 1963 Nobel Prize with Alan Hodgkin and Andrew Huxley for their discoveries concerning the ionic mechanisms involved in excitation and inhibition in the peripheral and central portions of the nerve cell membrane.

The final chapter of the study discusses the results of the study from the viewpoint of networks. As for the nominator network, the

people who nominated Granit were undeniably among the scientific elite. Furthermore, many of the scientists who proposed him were, particularly at the beginning of his career as a Nobel candidate, his close friends, or, in the parlance of Granovetter, his strong ties. To illustrate, five out of ten people who topped the list of Granit's most active correspondents in 19221968 nominated him for the Prize in Physiology or Medicine. In addition, some of the nominations can be indirectly attributed to his strong ties: Bernardo Houssay and Corneille Heymans, for example, were friends of Ulf von Euler, whereas the nomination submitted by Folco Domenici in 1951 clearly originated from the pen of Giuseppe Moruzzi, another colleague of Granit. It can thus be concluded that Granit's Nobel career as well as those of Charles Best, Hugo Theorell, and John Eccles suggest that a candidate's nomination pattern not only reflected their scientific capital but also their social capital. To put it simply, friends tend to nominate friends, and scientists with the right kind of friends tend to be more likely to receive prizes, honorary doctorates etc.

While this may appear trivial, it is, however, far from self-evident why friends tend to nominate friends. To call friendship itself an adequate motivation for nominating would certainly be an oversimplification. It is, to give an example, unlikely that any of Granit's friends would have proposed him, had he not possessed at least a minimum amount of scientific capital required for the Prize. In addition, it is difficult to distinguish between what should be attributed to social factors and what to cognitive factors. In other words, people who are friends tend to think along similar lines, and in many cases, share the same kind of background, values etc. Most importantly, one's friends also tend to be the first to read one's papers, and are, after all, those best equipped – and sometimes the only ones – to understand and to judge one's research.

In the spirit of Bourdieu, the nominations can also be perceived as an attempt to strengthen the nominators own position in the field. The struggle over limited resources may also help to explain why so many scientists nominated their own compatriots, a relatively com-

mon pattern among the nominators. However, rather than referring to Bourdieu's notion of social capital, many of the phenomena presented in the study are better explained within Coleman's and Putnam's framework, where social capital is transformed from an individual resource to an attribute of collectives. To take an example, it emerges clearly from the study that the majority of the nominators representing strong ties let Granit know about their nominations. (It has to be added that as a professor at the Karolinska Institute he would in any case have learned of all the nominations he received.) The Nobel authorities strictly deplored such behaviour, but seen from the network perspective the whole matter appeared in a completely different light. The nominations still served their official purpose, but at the same proposing one's close colleagues provided an opportunity to exchange favours and compliments between friends. Given the vast symbolic value of the Prize, the mere fact that one's colleague was willing to submit a nomination served as a gift and led to the strengthening and accumulation of social capital – provided, of course, that the nominee was aware of the nomination. In addition, in many cases the nominations formed but a link in what appears to have been longer and older chains of gift exchange. In other words, many of the nominations received by Granit were preceded by other gifts – visits, favourably book reviews etc. – and on many occasions it can be seen how Granit himself reciprocated, for example, by sending his books, or proposing an honorary doctorate for the nominee.

Even if the majority of Nobel laureates have been renowned scientists, it would be tempting to ask how many of the thousands of nominations were made primarily for a given purpose. Be that as it may, it can, however, be assumed that from the point of view of the network the rewarding of Prize was not always essential: only a fraction of the nominations resulted in awards, whereas by letting the nominee know about one's nomination, the nominator could make sure that his nomination carried weight within his or her networks, if not within the official structure of the field.

Finally, it has to be asked whether the nominations actually influenced the decisions of those making the awards. For only by answering this question can we determine whether networks served as a resource in a candidate's struggle over the Prize. As has been shown earlier, there was no obvious connection between the number of nominations of a certain candidate and the likelihood of his being successful. In addition, the members of the Nobel Committee as well as other professors at the Karolinska Institute could, if they so wished, step in and propose desired candidates. In fact, the prizes of 1943, 1944, 1945 and 1951 were based on last-minute nominations submitted either by the secretary or other members of the Committee. On the other hand, it is clear that nominations from prominent scientists provided the Committee with an additional guarantee of the soundness of its judgement. It also seems likely that some of the nominators acted in cooperation with or encouraged by their Swedish colleagues. What mattered most, however, was whether a candidate had "a friend" on the Committee. Whether they knew each other or not was not crucial; what was crucial was that someone on the Committee was motivated to speak up for a candidate and year after year to justify why this and not some other scientist should be awarded the Prize. Without such support, even potential candidates might be passed over, and this, eventually, caused Granit's friend John Eccles to view his Prize as a gift to be reciprocated: it would, of course, be an exaggeration to claim that Granit alone was to be thanked for Eccles' Prize, but at the same time Granit also found himself in a position where he could have prevented his friend from receiving the it.