The international workshop on science and patents, its origin and purpose

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Abstract. Since 2009 lectures on intellectual property in an international context were developed for an audience of researchers and engineers with a focus on patents and positioning the process of acquisition in an international context. The didactical approach puts a lot of value on the application of the principles of intellectual property acquisition to the actual personal research topics of the students. In parallel with the development of the intellectual property lectures, the International Workshop on Science and Patents (IWP) was set up to provide a discussion forum for researchers and engineers. The purpose is to give the inventors themselves an opportunity to present their experience with the process of applying for patents.

1. Introduction
In 2009 at the occasion of the bilateral collaboration project [1] between the European Patent Office (EPO) and the Japanese Patent Office (JPO) Prof. Dr. Hiromasa Goto expressed the need to provide lectures on intellectual property at the Tsukuba University. These lectures should focus on the following aspects: be addressed at scientists and engineers, concentrate on patents and position the whole in an international context. In addition he was wondering whether it would be possible to include in such lectures practical group work using on-going research topics to provide a hands-on environment for improved understanding of various aspects of intellectual property (IP) protection.

2. The International Workshop on Science and Patents (IWP)
Indeed, few lectures address the lack of knowledge of the inventors themselves on the process of acquiring intellectual property protection in an international context. Hence, since 2009 we developed a series of lectures with the goal of providing scientists and engineers with the essential knowledge about their role in the process of protecting their intellectual property at the global level. These lectures are since 2013 officially part of the PhD programme of the Institute of Materials Science at the Tsukuba University.

In parallel we realised that there is a need to offer a forum for researchers to present their experience with the process of obtaining patents and discuss how the researchers experienced and addressed the various problems, which emerged during this process. In contrast to the usual conferences and meetings for patent attorneys, lawyers, economists, policy makers and managers, the IWP discussion forum therefore aims at giving a voice to scientists and engineers, who are at the core of any invention.
The earliest interaction with the Tsukuba University goes back to 1996 at the International Conference on Science and Technology of Synthetic Metals (ICSM), held at Snowbird, (Utah, US). At that time I was carrying out post-doctoral research as a researcher from the National Science Foundation - Flanders at the Institute for Polymers and Organic Solids at the University of California Santa Barbara, renamed the Center for Polymers and Organic Solids (CPOS). The center, founded in 1982 as Institute for Polymers and Organic Solids (IPOS) by Prof. Dr. Alan Heeger and Prof. Dr. Fred Wudl, was converted to CPOS in 2000. CPOS combines interdisciplinary research in the fields of physics, chemistry, polymer science and biology. Expert knowledge from these disciplines provides the basis for a fundamental research programme aiming at developing new materials with functional properties. These materials are not only small molecules, but also conjugated organic polymers characterized by electrical conductivity, anisotropic linear and nonlinear optical properties, and novel electrochemical properties [2].

During my research stay at IPOS in 1996, I was strongly interested to expand my earlier research on polyisothianaphthene to other isothianaphthene based low band gap polymers. At ICSM 1996 Prof. Dr. Goto reported on his research combining polythiophene methines and polypyrrole methines with liquid crystal side chains [3]-[4]. This work built on the first results on polythiophene methines as reported by Chen and Jenekhe [5]-[6]. After sharing our experience on the synthesis of low band gap polymers, I returned to the lab and prepared the first polyisothianaphthene methine [7].

Following the successful synthesis of a soluble and stable polyisothianaphthene methine the very first collaboration with the group at the Tsukuba University was set up. The group at the Tsukuba University was at that time still headed by Prof. Emeritus Dr. Hideki Shirakawa. In 1999, about one year before Prof. Emeritus Dr. Hideki Shirakawa was awarded the Nobel price 2000, I went to the Tsukuba University with a grant from the National Science Foundation - Flanders and a foreign professor grant from the Tsukuba University. The combination of my knowledge on isothianaphthene chemistry and the expertise on liquid crystals developped by Prof. Dr. Goto and Prof. Dr. Kazuo Akagi resulted in the synthesis of a series of polyisothianaphthene methines with various liquid crystalline side groups [8].

At the level of research our collaboration has continued with the synthesis of other low-bandgap polyisothianaphthene methines such as chiral polyisothianaphthene methines having magnetic properties [9] and containing a chiroptically active substituent [10]. In the early phases of the development of the intellectual property lectures, the research topic on conducting polymers was also used as an excellent opportunity to discuss the practical aspects of intellectual property protection.
In 2001 I took up a position at the EPO to search and examine patent applications among others in the field of conducting polymers. During the years following my start at the EPO I stayed in touch with the group at the Tsukuba University. Over time we came to realize that there is a strong need among scientists for more detailed knowledge about intellectual property, at the national and the international level, and the role played by scientists and engineers. The bilateral collaboration project [1] between the EPO and the JPO provided a fertile ground to develop together with Prof. Dr. Goto new ideas and approaches to teach intellectual property in an international context.

3. Scientists and Engineers
The need to address an audience of scientists and engineers as expressed by Prof. Dr. Goto finds its origin in that most lectures on intellectual property and patents are aimed at an audience of intellectual property representatives, such as patent attorneys, people with a background in law and managers of companies.

However, scientists and engineers play an often underestimated key role during the prosecution of the patent application. First of all they are the actual creators of the invention. Secondly, they will provide the technical contents for the patent document. Finally they will provide scientific support to the patent attorney during substantive examination of the patent application.

It is therefore important that scientists and engineers know at which level they contribute in the overall management of an intellectual property portfolio. Furthermore, scientists and engineers also need to understand how the criteria for patentability are assessed by a patent office. And finally, they need to be aware of the various stages of the patent application procedure.

4. Protecting Intellectual Property by means of patents
Successful business needs IP protection based on a combination of IP rights (e.g. copyrights, trademarks, design rights and patents), which provide detailed definitions of technical and artistic ideas and concepts. This IP rights portfolio is used as a basis for value assessment of the intellectual assets of a company [11].

There are many reasons why the application for intellectual property rights may not be successful. Even when IP rights have been granted, the utilization of these rights may not provide the anticipated results. An appropriate IP strategy should consider the position of the organization in its socio-economic ecosystem, the various possibilities to acquire intellectual property rights and finally how to benefit from the utilization of the so-acquired intellectual property rights. Establishing such a holistic strategy requires the close collaboration of experts not only in research and development, but also in...
marketing, management as well as the involvement of specialists in the different intellectual property rights around the globe [12].

Prof. Dr. Goto points out that the protection of intellectual property is an important issue to support the return on investment in research and development. Obtaining a patent should be seen as one of the many pieces of a holistic IP strategy. Patents are an important tool that allows intangible intellectual property developed by companies and universities to be protected and are the main form of protection of scientific work in general. For scientists and engineers it is therefore important to know what constitutes a patentable invention and to have a general idea about the procedures to apply for a patent.

5. The international context of patents
The internationalisation of IP rights started among others with the Paris convention (1883) followed by a number of treaties and agreements, which have been developed during a time span of more than 100 years. Although the international Patent Cooperation Treaty was established in 1970, it took another 24 years to arrive at the General Agreement on Tariffs and Trade (GATT) in 1994, which comprises the Agreement on Trade related Aspects of Intellectual Property Rights (TRIPS).

Independent from the TRIPS agreement and about two decades earlier, the first regional patent organization was founded based on the European Patent Convention (EPC), which was signed in 1973 and entered into force in 1977 [13]-[15]. Since this mile stone, an increasing regionalisation of intellectual property organizations has taken place throughout the world: the African Regional Intellectual Property Organization (ARIPO) in 1976, its French counterpart the ‘Organisation Africaine de la Propriété Intellectuelle (OAPI) in 1977, the Eurasian Patent Convention (EAPC) in 1995 and the Andean Common Intellectual Property Regime (2000). The process of regionalisation appears to be far from finished. Indeed, it can be pointed out that in 1995 the countries of South-East Asia agreed on the ASEAN Patent Cooperation Treaty and more recently, in 2011, the South American IP Cooperation Project was initiated. Looking at this on-going process of regionalisation of IP it appears that these regional IP organisations are almost identical copies of the EPC system. It is not surprising that the EPC has become a model for regional IP organisations. Although each country in Europe has its own system for IP rights, for a uniform approach on patent rights, 38 European countries agreed to work together under the European Patent Convention (EPC) (Figure 3). Thanks to the powerful combined effort of these European countries the European Patent Office (EPO) has quickly become one of the leading patent offices in the world. Additionally a large amount of international applications filed under the regulation of the Patent Cooperation Treaty are in fact treated by the EPO as one of WIPO's International Search Authorities or International Preliminary Examination Authorities.

International cooperation is also increasing at the level of the classification of patent documents. The EPO recently announced on its website [16] that 'the Cooperative Patent Classification (CPC) is the most refined classification system for patent documents in the world (250 000 subdivisions) and was jointly implemented by the EPO and the United States Patent and Trademark Office on 1 January 2013. It is largely based on the European Classification (ECLA) system formerly used at the EPO. The CPC is already used by more than 45 patent offices worldwide as a means to perform efficient prior art searches during the patent granting process'. The State Intellectual Property Office of the People's Republic of China (SIPO), the Federal Service for Intellectual Property of the Russian Federation (Rospatent) and the Eurasian Patent Office (EAPO) also decided to join this cooperative effort.

For Japanese researchers and engineers it is thus more and more important to become familiar with the international aspects of patent rights in view of this ongoing and increasing regional and international cooperation. More specifically, it is important to understand the particularities of the EPC and the role played by the EPC in this process of regionalisation and globalisation of IP rights.
6. Procedural aspects of filing a patent application

Each region or country has its own specific legal and procedural system. However, each patent system is characterized by general common principles concerning the procedure of applying for a patent. The two important phases in the procedure are, firstly, the investigation of the ‘prior art’, mostly scientific literature published before the date of filing the patent application, and, secondly, an examination of the patent application by a patent examiner in view of relevant prior art to establish conformity with the local patent law system. There are two major criteria, which determine what is a patentable invention: the invention must be novel and must involve an inventive step. These criteria are applied quite similarly throughout the global patent system. Finally most patent systems provide the possibility to appeal a refusal of a patent application or for third parties to oppose a granted patent.

The international Patent Cooperation Treaty procedure of filing a patent application at the World Intellectual Property Organization (WIPO) is usually followed by entering the regional (e.g. EP) and/or national (e.g. JP or US) patent system. In the lectures at the University of Tsukuba the procedure for filing an international and European patent application before the European Patent Office is used to illustrate the general principles of filing a patent application.

![Figure 3. The 38 countries working together under the European Patent Convention.](image-url)

7. The European Patent Office and the European patent grant procedure

Although each country in Europe has its own system for IP rights, for a uniform approach on patent rights, 38 European countries agreed to work together under the EPC (Figure 3). For the EPO to grant a European patent in respect of an invention, its description and claims have to meet certain criteria. These are laid down in the EPC [13] and supported by the Guidelines for Examination [14], the latter being developed on the basis of the case law of the boards of appeal, the EPO's second instance in-house judiciary. The most important criteria to be met are the requirements that the invention, as defined in the claims of the patent application, is novel and involves an inventive step (Articles 54 and 56 EPC). These criteria are evaluated against the 'prior art', which consists of all knowledge made available to the public before the filing date of the patent application, commonly in the form of a publication. The evaluation ('examination') of the technical criteria is carried out in writing by an 'examining division' consisting of three technically qualified examiners (Article 18 EPC). If the examining division intends to refuse a patent application, the procedure is concluded by a non-public hearing ('oral proceedings'), which involves a highly technical assessment of the invention in view of
scientific and technical literature to determine whether the patent application meets the EPC requirements. At the hearing the owner of the invention, also called 'applicant' or 'proprietor', is usually represented by a patent attorney.

The European patent grant procedure is an examination procedure beginning with a formalities examination and a mandatory documentary search. The first stage ends with the publication of the European patent application and the search report. At the applicant's request this is followed by the second stage, substantive examination. After the patent has been granted, there may be a further procedure in the form of opposition proceedings or, upon request of the patentee, limitation or revocation proceedings.

On receiving an application the EPO examines whether it can be accorded a date of filing. This is the case if the application documents contain: an indication that a European patent is sought; information identifying the applicant; a description or a reference to a previously filed application. If the application has been accorded a date of filing and is not deemed to be withdrawn, the Receiving Section checks for compliance with the provisions governing translations, the content of the Request for Grant, the presence of claims, the filing of the abstract, representation, formal requirements, any priority claimed, designation of the inventor and the filing of any drawings.

While the formalities examination is in progress, the European search is performed. The search report is drawn up on the basis of the claims, with due regard to the description and any drawings. It mentions the documents available to the EPO when it is drawn up which may be taken into consideration in assessing novelty and inventive step. The search report is accompanied by an opinion on whether the application and the invention to which it relates meet the requirements of the EPC. The non-binding opinion is not published together with the search report but is available to the public by way of file inspection after publication of the application.

Once the request for examination has been filed, the EPO examines, in the light of the search report and the applicant's response to it, whether the application and the invention to which it relates meet the requirements of the Convention, and in particular whether the invention is patentable. If the application and the invention to which it relates meet the requirements of the Convention, the examining division will decide to grant a European patent provided that the requisite fees have been paid in due time and a translation of the claims into the other two official languages of the EPO has been filed in due time. The grant does not take effect until the date on which it is mentioned in the European Patent Bulletin. At the same time as it publishes this mention, the EPO publishes a European patent specification containing the description, the claims and any drawings. The European Patent Bulletin is published electronically on the EPO’s publication server (www.epo.org).

Up to nine months after publication of the mention that a European patent has been granted, anyone may give the EPO notice of opposition to the patent. As a result of the examination of the opposition the opposition can be rejected, or the patent can be maintained in amended form or be revoked.

Appeals may be filed against decisions of the Receiving Section, the examining divisions, the opposition divisions and the Legal Division. An appeal has suspensive effect, which means that the contested decision is not yet final (no formal res judicata) and its effects are suspended. [15]

8. Conclusion and future prospect
In addition to the acquisition of scientific knowledge and research experience, it is also important that the education of researchers and engineers includes an important focus on developing knowledge about intellectual property rights. Because researchers and engineers play a key role as inventors, they need to become aware of their role in the patent application process. This knowledge should not be limited to the technical and legal aspects of patent law systems, but should also include an awareness of the international regionalisation processes which are increasingly influencing the acquisition of IP rights at the global level.

The lectures at the University of Tsukuba combine essential theoretical knowledge with practical group work. The experience from straightforward examples is at a later stage applied to the personal
research topics of the students. As there are a variety of research groups at the Institute of Materials Science, the students are provided with the opportunity to discuss various research topics such as conducting polymers, solid state electronic devices and biological processes. During the presentations of their group work students experience and realize how the same principles of patentability are applied in various topics of research and technology.

The aim is to continue both educational activities for undergraduate, graduate and PhD students on the international aspects of intellectual property rights with a focus on patents, as well as educational research using synthesis of conjugated polymers. The didactical approach aims at merging student research with intellectual property education and can therefore be considered as unique in its synergistic approach to promoting simultaneously practical scientific research and knowledge on intellectual property. It is believed that the students having both a profound knowledge of intellectual property rights such as patents in an international context and a thorough experience with carrying out scientific research will be well equipped to take an active role in the community of science and technology after their graduation.

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