that miscarry.

At this point, it seems appropriate to give a few suggestions to those who may wish to prepare themselves for a career in chemical patent practice. Those who form this intention early, while still undergraduates, should take the most intensive courses available in English composition. It often seems harder to teach writing to a chemist than to teach chemistry to a writer. For those who have completed their intended schooling in chemistry, several procedures are open. They may go directly to law school on a full time basis, completing the course generally in 27 to 33 months, and then seek employment in a patent department. Alternatively, they may seek employment as chemists, or possibly as chemical Patent Examiners in Washington, and study law in the evenings for about four years, before moving to the practice of patent law. For those who are now employed as chemists, the alternatives are only slightly different. One can go to night law school and enter patent work after graduation, or one can enter a corporation Patent Department as a Patent Agent Trainee, and study law as the opportunity arises. Many chemical companies do not require all members of the Patent Department to be lawyers either at time of employment or as a condition for continued employment. It seems probable that for at least another generation lawyers who are also competent chemists will be quite rare. For that reason, those who do have this combination of qualifications will be much in demand not only as patent solicitors, but as counsel and barristers in chemical patent matters. Similarly, the shortage of lawyer-chemists insures a continuing need for writer-chemists in the solicitation of Chemical patents.

To summarize, the role of a patent solicitor is to be a communications specialist, receiving the message from the inventor, comparing it with prior knowledge, phrasing it in scientifically sound and legally sufficient terms, and advocating its acceptance by the Patent Offices of the world. In patent applications dealing with chemistry, as in other fields of technology, the best job of advocacy and the most meaningful communications can be done by those who make knowledgeable use of the vocabulary of that science. Chemical patent solicitors should be chemists or chemical engineers.

Opportunities for Chemists as Patent Attorneys

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Other papers in this symposium have given you some insight into the intriguing field of patent work and have suggested ways in which a chemist can take part in that work without giving up his professional status as a scientist. I would like to play another stanza of this tune and show you something of the patent attorney's life.

The acquisition of the necessary legal background to become a patent attorney requires further formal education—three years by day or four years by night—in law school, taking the same courses that all would-be attorneys take, regardless of whether they plan later to enter a specialized field such as patent law. The mental hurdle which may have to be overcome is that the patent attorney's colleagues will probably think of him as a lawyer rather than as a scientist. For some, the thought of being identified as an everflowing source of "whereas clauses," various and sundry Latin expressions (pronounced, by the way, as a lawyer and not as a Latin scholar), and all types of legal gibberish in general, is completely unpalatable. But for others who can ignore such gibes it is readily recognized that a patent attorney's profession encompasses deeply interesting and intriguingly challenging tasks, each of which is unique.

Mr. Heindel's paper discusses in some detail one of the principal pursuits of most patent attorneys—applying for a patent and conducting the prosecution of the application to a final disposition, hopefully the issuance of the patent. In this role the patent solicitor begins to appreciate the truth of the expression, "We live by our words, both written and spoken, as well as our brains." That is probably the most important skill that the attorney can possess, and, undoubtedly, is an extremely valuable asset for anyone, regardless of his profession.

There are two main functions of an attorney's professional life which depend not only on his ability to communicate precisely, but also on his ability to understand and to assimilate the communications of others. The attorney is both a counselor and an advocate. The function of being a counselor is not greatly different from that same function in many other professions. Each scientist in the business world will frequently find himself advising his superiors or his co-workers with respect to his particular area of interest. Furthermore, in order to be able to advise correctly, he must be able to assimilate the theories, opinions, and observations of others as reported in the technical journals. The attorney, likewise, does this by reading court decisions and statutes in the areas of his interest, as well as dissertations on legal principles in law school journals. From the report of each decision, the attorney is trained to derive a "rule of law," which can be employed as a principle in a later case embodying a similar, but not identical, fact situation. In common parlance, this is "logical reasoning," which is an equally valuable talent for the scientist.

Another characteristic of the attorney's training is the development of the ability to look at all sides of any

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question. This is quite different from the approach which one is taught to employ as a chemical engineer. In attacking any engineering problem there was assumed to be a single solution, which combined the optimum in efficiency, economy, and "good design." Accordingly, every effort was aimed at reaching that solution, with any minor distracting influences and any unknown factors being estimated or ignored so as to pave the way to the solution.

In law, a problem is examined from all sides, is poked, twisted, taken apart, and reassembled until all of its strong points and its weak points are identified and understood; and only then does one devise a solution along with the argument to convince a judge or jury that the advocated solution is the correct one. This multi-sided examination is absolutely essential in order to anticipate and to rebut the arguments of the opposing counsel. The challenge lies in trying to fit one or more rules of law onto the fact situation presented by the client so as to reach a solution which seems to be in accord with previous decisions. This is, of course, usually complicated by the actions of the opposing counsel, who is adept at pointing out where the law you have selected is a glaring misfit, and the law he has selected not only is a more perfect fit but dictates the opposite solution which he is advocating. Thus, the patent attorney, like any other attorney, must not only be a communication specialist in legal and scientific matters, but he must be an expert in distilling the essences from the statements of others and in using those essences in opinions or arguments in a manner that will convince others of the correctness of his position.

One of the fields which might attract a patent attorney is the field of litigation. The litigation specialist is the Perry Mason of the patent profession. The usual patent law suit involves the questions of validity and infringement of patents. The attorney first construes the language of the patent to determine what the invention is and exactly what its valid breadth and scope should be. These constructions are frequently somewhat different from those intended by the inventor and his patent solicitor who chose the language of the patent. Based upon this construction and interpretation of the patent language, the attorney must then determine whether the patent is valid as measured by all of the statutory standards, which, in turn, may or may not have been already interpreted by court decisions. Only after all of these preliminary steps can the invention be compared with the actions of the alleged infringer to see whether he is practicing the invention without authorization. Finally, the patent attorney must so prepare and present his case that, after all of the pretrial conferences, the study of documents, the trial before the court, the examination of witnesses, and the submission of written briefs of law, he convinces the judge or jury that the attorney's position is more just and more nearly correct than the arguments of the opposing attorney.

Validity and infringement actions are not the only types of patent litigation which the patent attorney encounters. There may be, for example, suits which, in effect, are appeals having the objective of forcing the Patent Office to grant a patent after it has refused to do so for any of various reasons. Patent attorneys also frequently get involved, to some extent, in litigation concerning anti-trust matters and unfair competition when a controversy arises over the proper or improper use of patents.

A particularly complex and unique type of litigation arises when two or more patent applications by different inventors, claiming the same invention, appear in the Patent Office at about the same time. Surprisingly enough, this occurs about once out of every fifty patent applications. This type of litigation is called an "interference," and is instituted by the Patent Office for the sole purpose of determining which, if any, of the interfering applications is entitled to the patent claim in controversy. It has been said that it is easier to prove a person guilty of murder than it is to prove that he is the first inventor in an interference proceeding. It is mainly because of the heavy burden of proof in intricate interference proceedings that patent attorneys insist upon the keeping of good notebook records by the research scientist.

A substantial proportion of all patent attorneys are self-employed or are partners in law firms. These attorneys usually offer the entire spectrum of legal services, that is, counseling, patent soliciting, and patent litigation. The remaining proportion of patent attorneys are those who are employed by corporations to perform some or all of these same legal services I have just mentioned, but usually with the additional responsibility of advising how to manage the patent affairs of the corporation most effectively and profitably. Thus, the business aspects of patent management may constitute a larger factor in the daily life of the corporate patent attorney than that of the self-employed attorney who deals with several clients.

The corporate patent attorney has many types of tasks and problems to face in addition to patent solicitation—tasks which actually may consume the major portion of his time. Trial litigation usually is handled by attorneys from an independent law firm because of their familiarity and experience with courtroom tactics and the presentation of evidence. The corporate attorney finds that he has an important role to play in being an adviser to the trial counsel with respect to the technical matters involved in the litigation as well as being the one who represents the corporation in all of its legal dealings with the trial counsel.

Patented and unpatented technical information is a product of the corporation which may be sold or rented in the same fashion that manufactured goods may be handled for profit. The corporate patent attorney finds that a sizable portion of his time is spent in negotiating and drafting licenses and other agreements which obligate his employer to pay for the use of another's technology or which obligate others to pay for the use of his employer's technology. This facet of the attorney's life combines his business acumen with his legal ability to formulate an unequivocal, binding contract.

The patent attorney soon becomes a reservoir of information derived from the patent literature, and, as such, he is frequently called upon to give guidance to research. In most instances, it is highly desirable for the research scientist to know as much as possible about the relevant patented technological advances before starting a specific project. It may be the task of the patent attorney to so inform the scientist and to suggest lines of research which might avoid infringement of the patented areas. The technology in patents is so vast,

however, that it is impossible for most attorneys to keep up to date in a thorough fashion.

A related and very important use of the same patent information is to guide the corporation's sales and manufacturing operations into areas that will not infringe the patents held by others. Before there is any sizable financial investment in any new process or equipment for a manufacturing operation, it is evaluated in relationship to existing patents. Similarly, studies are required before the salesman can be permitted to teach a customer how to use a particular product, since it frequently is found that the very idea which the salesman wishes to pass on to his customer is the subject of someone else's patent.

There are many, many other corporate activities which require the patent attorney's advice. Advertising and publicity are potential sources of patent difficulties. Scientific journal articles may need the editing of a patent attorney to prevent untimely disclosures of information. Citizen John Doe frequently has an idea which he thinks will make a great deal of money, but he doesn't have the capital required to get into production. Consequently, he submits his idea to the most likely manufacturer, expecting that it will immediately appeal to the manufacturer, who will in turn begin transforming John Doe into a multimillionaire. Once in a while John's idea turns out to be identical with one that the manufacturer is already actively pursuing, and when John later sees his idea on the market it is easy for him to believe that a little theft has taken place. The patent attorney frequently is called upon to handle such matters in such a way as to evaluate good ideas for the benefit of both the manufacturer and John Doe, and to minimize liability when those ideas are already in the manufacturer's hands.

Almost every phase of a patent attorney's professional life calls for a more or less intimate knowledge of what we call the "prior art." The "prior art" of any given subject is, in its simplest terms, all that has been previously known to man about that subject. In the field of chemistry, I am sure all will agree, both the chemist and the chemical patent attorney need an easier access to the prior art. It is unnecessary to remind one of the mental strains involved in trying to absorb great quantities of technical information, which, at a moment's notice, can be desorbed and fractionated to recover whatever portion is desired. Except for those rare individuals with vast and nimble memories, the storage and retrieval of great quantities of information soon become such enormous mental tasks that we devise our own private indexes, card files, abstract systems, *etc.*, to take some of the load off our memories. Unfortunately, speed and accuracy usually are not compatible in such systems, and the long accurate search is a terrible waste of man-power in this age of high speed. The progress that has been made in finding suitable solutions to this information problem has been remarkable and varied. Recent articles tell of some of these solutions.[1] A short history of what the du Pont Company has done in the storage and retrieval of patent information may be of interest.

A few years ago our Engineering Department entered into a study of ways to store and retrieve valuable engineering design data which had accumulated over many years. They took the basic principles of a known system for indexing information and added modifications to make it practical and applicable for almost any type of information. The basic system is called a "concept coordination" system in which information is stored in an inverted manner, similar to that of an index in a book. A single concept, for example titanium tetrachloride, would be indexed by indicating each patent where that concept occurs. By a simple coordination of any combination of concepts, one can determine which patents relate to that combination. In its simplest form, this inverted system has been used by many organizations, but it suffers from an inherent characteristic of supplying false answers as well as right answers to questions. Our information engineers improved the simple inverted system by adding syntactical and grammatical controls. These controls minimize the false retrieval of documents. Thus, a document which deals with water-cooling is not retrieved when one is looking for the cooling of water. Similarly, a document which deals with the distillation of methanol and its reaction with acetic acid would not be recovered in a search for the distillation of acetic acid. A more complete explanation of this system is given in a series of recent papers.[2-4]

These controls brought the original system from one of limited utility to one of far-reaching applicability. After the system had been applied successfully to engineering design data and to chemical and physical research data, it was decided to try it on patent information. The Plastics Department of the du Pont Company selected about five thousand United States patents in the field of polyolefins and undertook to index the information contained in each patent and to store it in a way which is compatible with that already employed for design and research data.

These same five thousand patents are ones which have already been incorporated into our files in the traditional way—abstracts of the patents are printed on cards, which, in turn, are filed in various cross-referenced files by subject-matter, by patent number, by inventor, and by owner. Thus, our attorneys expect to be able to make a good comparison of the desirability of this new system with our present time-worn, but reliable, system.

The product of the concept coordination system can take any of several forms. It can remain as stored information in the electronic computer which was used to assemble and collate all of the fragments of indexed information. The computer then may be used to perform the search as requested by the computer operator. Alternately, the assembled information may be printed in some form,—for example, as a dual dictionary, for manual searching. It also may be placed on "peekaboo" cards for manual or visual searching. Many other modes of using the indexed information are available.[1,5] We propose to use the computer for searching in our system at du Pont.

How our legal collegues will react to this storage and retrieval system, is not known with certainty, but it will be a great surprise if they do not become enthused over its versatility and its capabilities. Our research scientists will be able to search the patent literature for guidance in their work, and, if the search is performed by an electronic computer, it can search patents, research data and design data all at once.

A conservative estimate indicates that our information system will cut the searching time of attorneys and scientists by 80-90% for any one search, although it will

probably induce searches which previously would have been omitted. The other side of this rosy picture, however, is that it unquestionably is more costly to index and store the information than the previously used, less sophisticated systems. A very important part of our forthcoming evaluation will be to determine whether the cost of maintaining the system is overcome by the benefits achieved.

There are many improvements yet to be made before the best indexing system can be selected. Chemical nomenclature and patent terminology can well afford to be improved. There is a need for the organization of scientific terms into levels of specificity, from the broadest to the narrowest. There is a great opportunity for information analysts who are experts in chemical technology and in patent terminology. It should be apparent that the opportunity does not stop with the patent literature, but extends to almost any type of information where the volume or complexity of it is such that a system for its storage and retrieval is essential. If the computer or other storage device has enough capacity, and if the indexing has extended to a broad scope of information sources, a single search can include patents, technical journals, correspondence, advertising, textbooks, and any other source which has been indexed. The manpower waste involved in repeating research which already has been completed and either forgotten or never appreciated is enormous. By the same token, the time which is now spent by many on long searches could be turned to other important matters. The problem of storing and retrieving information is now being fought, and it needs all the brilliant attention it can get.

These remarks have hopefully pointed out that many challenges and opportunities are open in the field of patents to the chemist for whom the study of law has some appeal. The supply of patent attorneys has not met the demand for a long time. The scientific background and working experience in the field of science form an excellent foundation for building a career as a patent attorney. A creative mind, along with an ability to communicate thoughts, can lead to great accomplishments in patent solicitation, advising and counseling as to the management of patent affairs, or as a trial attorney. If the switch to law is too much to swallow, some of these same fields are open to the non-attorney; and the very important, new area of information analysis, storage, and retrieval is yet to be mastered.

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