the term nexus we mean a region where the plasma membranes of two excitable cells are fused. In smooth muscle fixed in permanganate, a nexus comprises three dark lines of uniform thickness separated by two lighter regions (Fig. 3). Wherever a nexus exists, the resulting direct fusion of the outer layers of the cell membranes without intervening extracellular space allows electrotonic spread of current from one cell membrane to another in a way similar to its spread along an axon. This is probably the mechanism for propagation in smooth muscle. The nexus might also occur in other excitable tissues. In the heart where propagation is apparently by electrotonic spread (*9*), some regions of the intercalated disc may in fact be nexuses (*10*). In the brain also there are interactions between groups of cells from which one might infer the existence of a nexal relation.

It is probable (*1*) that in smooth muscle current between active and inactive cell membranes is responsible for the propagation of action potentials. From the duration and velocity of action potentials in various smooth muscle cells it is inferred that many active cells are current sinks while many neighboring cells are current sources. Direct measurements on cat intestinal muscle corroborate this conclusion (*11*). Moreover, values obtained for action potentials and high potassium depolarization by the extracellular sucrose gap technique (*12*) approach the values obtained with intracellular microelectrodes. The success of the sucrose gap technique is due to the attenuation of current by increasing extracellular resistance between recording electrodes. The simplest equivalent circuit accounting for these data would have a direct electrical connection between cell interiors without intervening extracellular space. This, of course, is exactly what the nexus provides while maintaining cellular integrity.

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Patent Office Search Files: A Tool for Historical Research and Technological Development

Abstract. The classified search files of the U.S. Patent Office are useful for locating a desired patent record. The method of constructing these files, and the tools needed to enter the classification scheme at the proper locus, are described.

A recent article (*1*) has pointed out the value of the original records of the United States Patent Office as sources for the history of invention and technological property. These original documents are stored, and hence are not easily available for research and for browsing. As briefly noted in that article, in addition to the numerically (chronologically) arranged set of printed patents (as granted by the Office), a classified patent file is maintained in a public search room in the Department of Commerce building in Washington. With the proper tools of entry to this file, one can, for example, locate an invention without knowing the name of the inventor, his assignee (if any), or the date of the grant.

Three tools exist for entry into the classification hierarchy referred to in the Patent Office as the Classification Schedule. The first is a published list of five areas of invention, subdivided into over 300 classes and over 57,000 subclasses. This Schedule is printed in loose-leaf form (*2*) and is updated quarterly. It is constructed and maintained by the classification division of the Office. A manual of complex rules for its construction (*3*), though now out of print, is available for study in the Scientific Library of the Office. Since each patent in the file contains an evaluation of the contribution which the inventor has made to the art, the construction of the Schedule can be based upon this evaluation. In practice, patents containing like contributions are first grouped, then the relationships expressed in the differences between the groups are noted, and finally, these differences are used as a basis for establishing the subclasses.

The second tool, auxiliary to the first one, is a very extensive set of definitions of the subject matter contained in each class and subclass of the Schedule, including complex cross search notes for related subject matter, and for combinations and for subcombinations which have been separately classified. By proper definition, it is possible to create one and only one place for any combinatorial relationship which may exist at the time of definition, or which may be conceived at a later time. Although these "definitions" are not published or available for sale, a 12-volume set in loose-leaf form is maintained for the patent examiners, and is updated quarterly to conform with changes in the Schedule. Additionally, a set is available for consultation at the public search room.

A third tool is maintained for those who are unacquainted with the organization of this complex Schedule. It consists of an index to the Schedule, published therewith, which is maintained to aid one in entering the Schedule at either the proper place, or at a place where the search notes designate several other places for different inventions which might be described by a common term. Since this index is not generally used by professional patent searchers who almost uniformly rely on their knowledge of the intricacies of the Schedule, the index is revised only infrequently. It may, therefore, refer to classes or subclasses which have since been abolished, or from which the subject matter sought has been removed.

These classified files have other and important significance for those people, other than patent examiners and attorneys, interested in technical information (*4*). A report to a former Secretary of Commerce (*5*) stated:

". . . the files of the Patent Office comprise a veritable treasure house of information upon which much of our industrial progress has been based, including ideas whose significance may not be realized for years after the disclosures. They give today a clear indication of the present thinking of the most ingenious minds in the country as to where we will be five years or more in the future. . . ."

The contents of the individual patents contain the distilled essence of technical know-how, developed not only in this country but in many of the industrialized countries abroad. This know-how is detailed at each stage in the evolution of the article, process, machine, or composition of matter being described, and covers the complete range of endeavor in which inventors are and have been working to produce goods and services for the public. In effect, these patents can be made to serve as a continuing text of design solutions which can be helpful in development of new goods and services.

One can also use these files to study the development of a particular art. In some cases, such as the art of protection mechanisms, it is even possible to study the seesawing contest between the members of the underworld and the public protectors. And it is also possible to follow the historical development of such arts as photography, radio, and so forth.

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Erythrocyte Life Span in the Guanaco

After the original observation by Mandl (*1*) that the erythrocytes of the dromedary (*Camelus dromedarius*) are elliptical disks, Gulliver (*1*) reported similar findings in other members of the family Camelidae: vicuna (*Lama vicugna*, var. *mensalis*), alpaca (*Lama glama*, var. *pacos*), and guanaco or wild llama (*Lama guanicoe*, var. *huanachus*). In the guanaco, these nonnucleated and elliptical erythrocytes were observed to have an average length and width of 7.5 and 4.0 μ, respectively (*1*). Cameloid erythrocytes have also been observed to be more resistant to hypotonic saline hemolysis than the round, biconcave cells of man and other mammals studied (*2*).

Limited studies of erythrocyte survival after injection of glycine-2-C^{14}, which labels eight of the 34 carbon atoms of the protoporphyrin moiety of hemoglobin, have revealed longer survival times in mammalian species originally indigenous to high-altitude environments. Erythrocyte survival times for rat (*3*), man (*4*), and horse (*5*) are approximately 55, 120, and 140 days, respectively, whereas in aoudad or Barbary sheep (*Ammotragus lervia*) (*6*) and Himalayan tahr goats (*Hemitragus jemlaicus*) (*7*), erythrocyte survival times have been reported to be as long as 170 and 165 days, respectively.

Figure 1 shows the results obtained after injection of glycine-2-C^{14} (500 μc) into two mature guanacos caged at the San Diego Zoo. Median erythrocyte survival times were calculated, as previously described (*6*), to be 225 days for both guanacos. In this method the median survival time ($t_{\frac{1}{2}}$) is a quantity defined by the equation $p(t_{\frac{1}{2}}) = \frac{1}{2}$, where $p(t)$ is the probability that an erythrocyte will have a survival time greater than t. It is quite evident, however, from inspection of the specific activity-time curves that although half of the labeled cells had been destroyed by 225 days, there were two distinct processes occurring; this accounts for erythrocyte longevity in the guanacos. The first, linear process was similar to that reported in swine by Bush *et al.* (*8*) and accounts for the destruction of 30 to 40 percent of the cells by about 200 days (see Fig. 1). The remaining labeled cells, which survived earlier destruction, were then removed from the circulation by an exponential process. The rate of

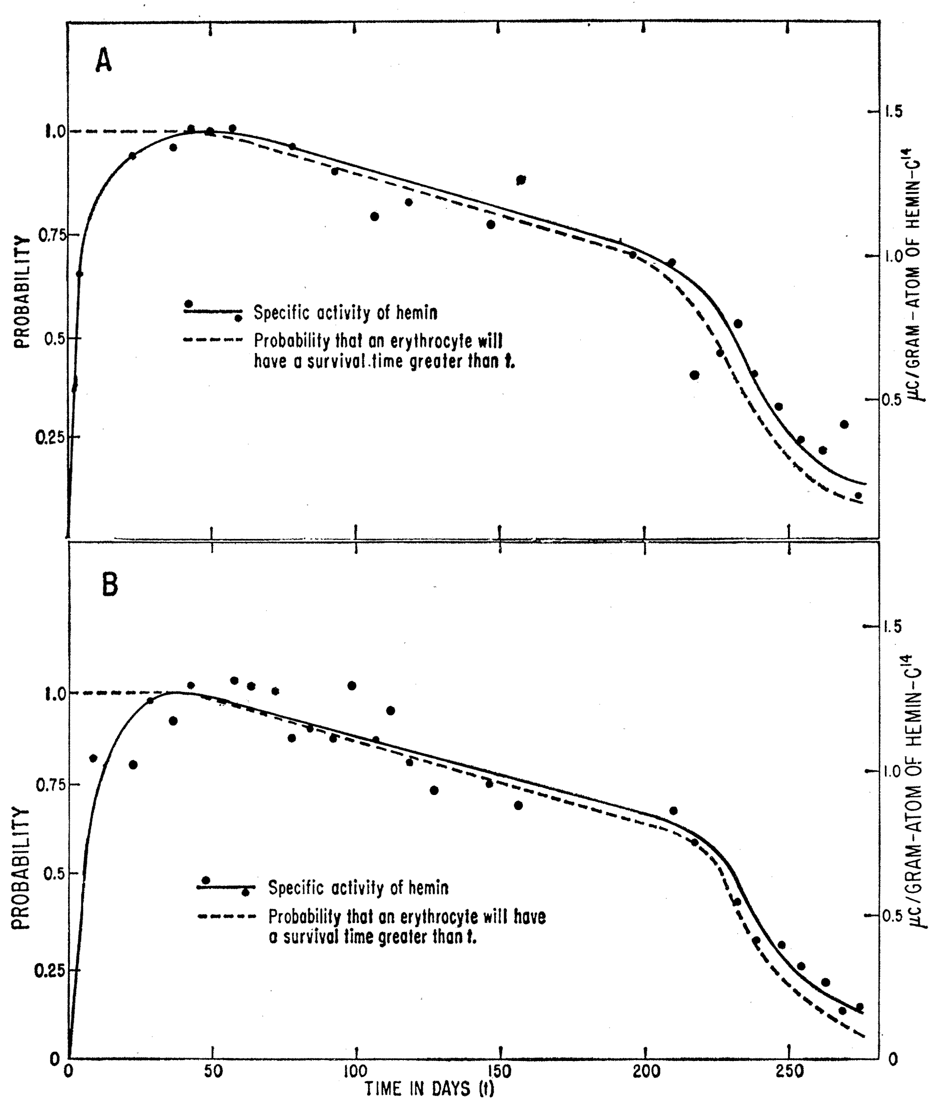

Fig. 1. Probabilities of erythrocyte survival and specific activities of hemin in two guanacos (*A*, female; *B*, male) after intravenous injection of glycine-2-C^{14}.