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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10 May 1962

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

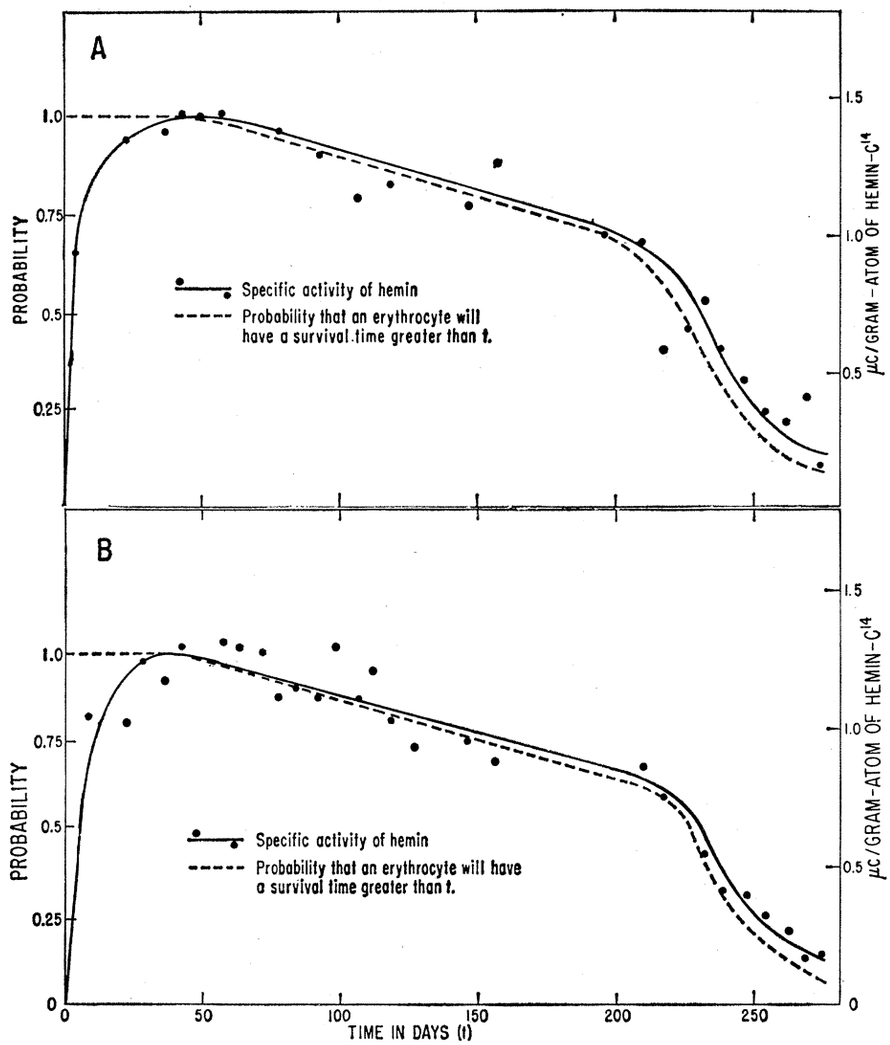

Fig. 1. Probabilities of erythrocyte survival and specific activities of hemin in two guanacos (*A*, female; *B*, male) after intravenous injection of glycine-2-C^{14}.

maximal destruction of red cells occurred at approximately 235 days in both guanacos. We do not know of any species with similar erythrocyte survival times. The elliptical erythrons of Camelidae may be unique in their longevity as compared to the circular, biconcave erythrons of other mammals (*9*).

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Occurrence of a Porphyrin Pigment in Streptomycetes

Abstract. The formation of an intramycelial red pigment of coproporphyrin type in submerged cultures of *Streptomyces griseus* and *S. fradiae* was detected. Its production is more intensive in the variants of *S. griseus* Z38 that give a low yield of streptomycin, and in the absence of Fe^{++} in fermentation media.

Despite the growing knowledge of the physiology of actinomycetes, relatively little is known about the chemical nature of their pigments that lack antibiotic activity. Many of the antibiotic pigments of actinomycetes are of the quinonic type (*1*), as are probably some of the nonantibiotic pigments which function as *p*H indicators. Some actinomycetal pigments that possess antibiotic properties, such as holomycin, thiolutin and aureothricin, are relatively simple derivatives of pyrrole (*1*); the orange antibiotic pigment found in a streptomycete related to *Streptomyces ruber* and *S. roseo-distaticus* (*2*) is prodigiosin-like in nature. However, the accumulation of true porphyrin pigments in actinomycetes has so far not been described.

During our study of the physiological relationships of streptomycin biogenesis in *S. griseus* Z38, we have observed the production of a mycelium-bound red pigment that was formed during the submerged cultivation of the organism on a reciprocal and rotary shaker, with a variety of complex and synthetic growth media. During the growth of the organism on Ferguson's (*3*) and other synthetic nutrient media, the production of the pigment was favored by the absence of iron salts. A pigment concentrate was obtained from the 5-day submerged culture by adjusting the *p*H value of the fermentation liquid to 2, separating the mycelium by filtration, and extracting it with an adequate volume of ethyl acetate. This crude ethyl acetate extract, which showed an intense reddish-violet fluorescence in ultraviolet light, was further purified by extraction of the red pigment from ethyl acetate to water at *p*H 6.0 and by repeated extraction to ethyl acetate, after acidification of the aqueous phase to *p*H 5.4. After this process had been repeated four times the pigment was transferred from the acidified aqueous solution to ether and then extracted with 0.1*N* hydrochloric acid. After adjustment of the *p*H of this extract to 2.0 the pigment was again extracted with ether. This final ether extract was evaporated to dryness, which left a purified concentrate of the pigment in the form of a dark violet amorphous residue. The amount of this concentrate was too small for further purification.

The solution of this material in ether showed absorption peaks at 598, 623.5, 569, 527, 499, and 397 mμ in order of increasing intensity, whereas its solution in 0.1*N* HCl showed absorption maxima at 590, 548, and 400.5 mμ. The HCl number estimated by the method of Willstätter (cited in *4*) was 0.09. The pigment was not soluble in chloroform. These results clearly suggest that the pigment is a porphyrin. The analytical data obtained coincide with those given by Jope and O'Brien (*5*), Todd (*6*), and Lemberg (*4*) for coproporphyrin. The formation of this pigment was also markedly augmented during the degeneration, in respect to streptomycin production, of the strain of *S. griseus* Z38. A pigment of a similar type was also found in iron-deficient submerged cultures of *S. fradiae*.

These results show that the formation of porphyrin pigments, known so far in yeasts, fungi, and bacteria (*1*), occurs in actinomycetes as well.

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Action of Tetanus Toxin in the Cerebral Cortex

Abstract. Injection of more than ten mouse lethal doses of tetanus toxin into cat's motor cortex produces seizures accompanied by cortical electrical convulsive discharges. During the hours preceding onset of large seizures, "antidromic" inhibition of evoked cortical activity is reduced. The similarity of these effects to those observed in spinal cord suggests operation of similar inhibitory transmitters in the two parts of the central nervous system.

Tetanus toxin has a specific pharmacological action in the spinal cord: it progressively reduces transmission at all inhibitory junctions. Since all types of inhibition are equally affected no matter what their central connections (*1–3*), one may infer that the transmitters at such junctions are very similar, or perhaps are the same substance. We have investigated the effects of tetanus toxin on the electrocorticogram and on inhibition in the cerebral cortex. It has been reported recently that cerebral injection of tetanus toxin may produce convulsive activity and foci of electrical discharge (*4*). The prerequisite for a study such as ours is knowledge about a form of synaptic inhibition that occurs in the cortex. This condition is met in the case of "antidromic" cortical inhibition: repetitive stimulation of the bulbar pyramidal tract causes inhibition of spontaneous activity of cortical units (*5*) and of responses to peripheral or cortical stimulation (*6, 7*).

Acute experiments were carried out with cats receiving artificial respiration while immobilized by intravenous injections of Flaxedil. After brain exposure under ether anesthesia the animals were maintained with a long-lasting anesthetic. Details of these methods have been described previously (*8*). Approximately 1 to 10^5 mouse lethal doses of tetanus toxin suspended in 10^{-3} to 10^{-4}