these properties. But here conventional comparisons ended. And unconventional ones began.

First, during assays of enzymatic activity, Dr. Whitaker noted that this enzyme from the soil bacterium broke up the insulin molecule in a manner strikingly similiar to that of an enzyme found in the pancreas, the complex gland in the body which secretes insulin and digestive enzymes. This latter enzyme, pancreatic elastase, was moreover matched by the soil enzyme in another extremely significant way: both enzymes were severely handcuffed by a substance called Diisopropyl Phosphorofluoridate. The data indicated not only that the enzymes both had the same link around the active part of the enzyme chain but also that this portion involved the amino acid, serine. The same experiment enabled Dr. Whitaker to conclude that only one such link was active in both enzymes.

At this time the complete amino acid sequence in the α-lytic protease chain was being determined in collaboration with Dr. L. B. Smillie of the Department of Biochemistry, University of Alberta. Sections of the skein of approximately 200 amino acids were amazingly similar to corresponding sections in other serine proteases, enzymes which, like pancreatic elastase, are proteolytic and contain a serine at the active site.

In the wake of this detailed study there came to the fore yet another surprising conclusion which spelled the end of a popular misconception about the pancreatic serine proteases. It was known that all the pancreatic enzymes have a segment containing two residues of an amino acid called histidine. Moreover, it was known that histidine was essential to the activity of the enzymes. This suggested that the two histidines were active in catalytic reactions – a view widely accepted until the discovery of the soil enzyme. The α-enzyme was found to contain only one histidine link in the molecular chain yet, undeniably, this enzyme acts in exactly the same way as do the pancreatic proteases. Significantly, the sequence around its sole histidine proved to be homologous with the sequence around one of the two histidines in the other pancreatic enzymes. Here, then, was strong evidence afforded by Dr. Whitaker's group that only one histidine residue took part in catalysis. This view was confirmed shortly thereafter by X-ray studies of the three-dimensional structure of the pancreatic proteases. →

Striking similarities were discovered in corresponding sections of serine proteases from mammalian pancreas and α-lytic protease from a soil bacterium. The order of the amino acid units (denoted by three letter code words) around the histidine (HIS) and serine (SER) regions of the enzyme chain are shown below.

On a découvert qu'aux régions actives de la chaîne moléculaire, les enzymes pancréatiques et la α-lytique protéase, enzyme bactérienne, se ressemblent d'une façon frappante. Ci-dessous, ces acides aminés (désignés par les trigrammes) en série dans les régions de l'histidine (HIS) et de la sérine (SER).

I

TRYPSIN TRYPSINE	VAL	SER	ALA	ALA	HIS	CYS	TYR	CYS	SER
ELASTASE ÉLASTASE	MET	THR	ALA	ALA	HIS	CYS	VAL	ASP	ARG
CHYMOTRYPSIN CHYMOTRYPSINE	VAL	THR	ALA	ALA	HIS	CYS	GLY	VAL	THR
α-LYTIC PROTEASE α-LYTIQUE PROTÉASE	VAL	THR	ALA	GLY	HIS	CYS	GLY	THR	VAL

II

TRYPSIN TRYPSINE	GLY	ASP	SER	GLY	GLY
ELASTASE ÉLASTASE	GLY	ASP	SER	GLY	GLY
CHYMOTRYPSIN CHYMOTRYPSINE	GLY	ASP	SER	GLY	GLY
α-LYTIC PROTEASE α-LYTIQUE PROTÉASE	GLY	ASP	SER	GLY	GLY