

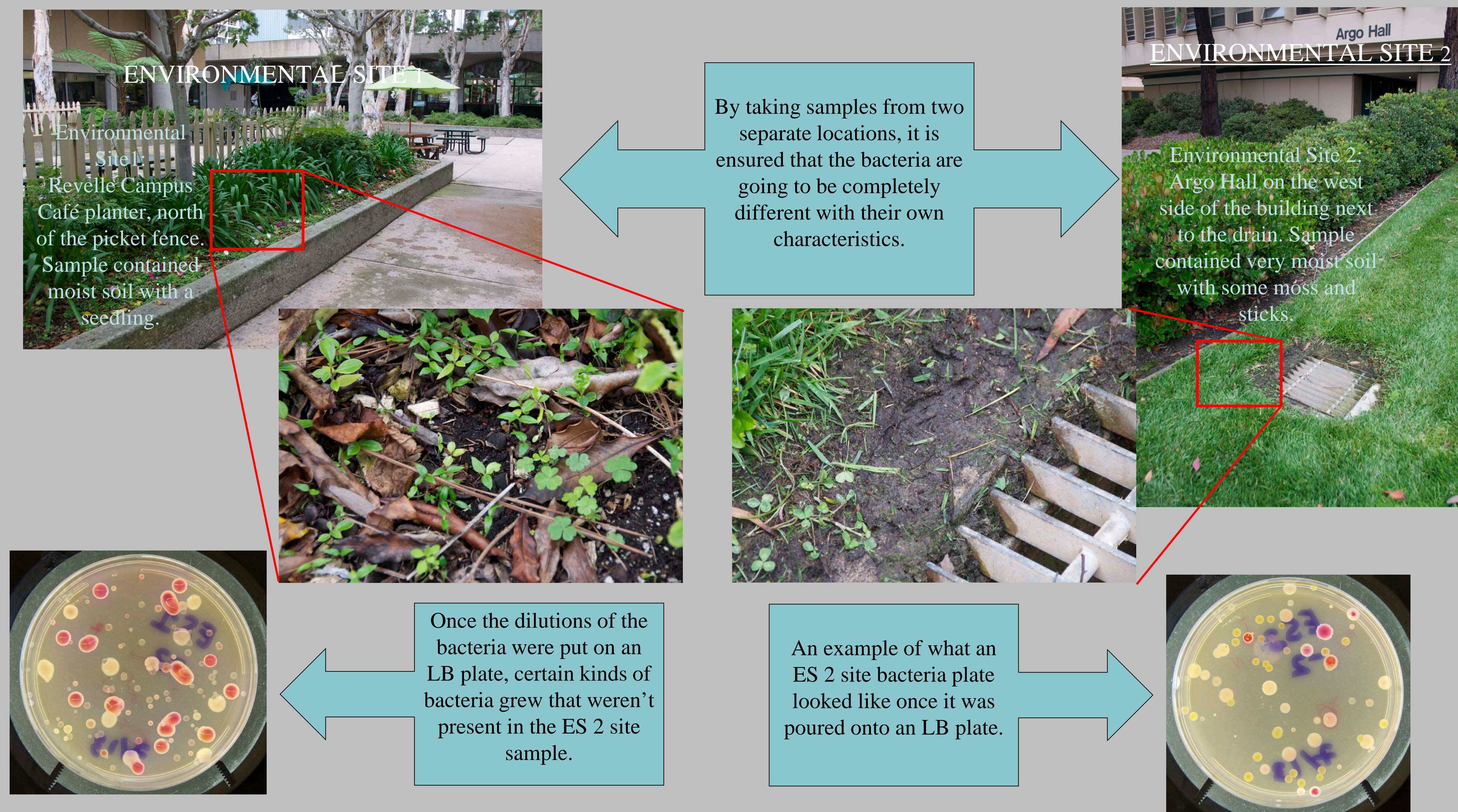
# Discovering Behaviors and Interactions Between Soil Bacteria

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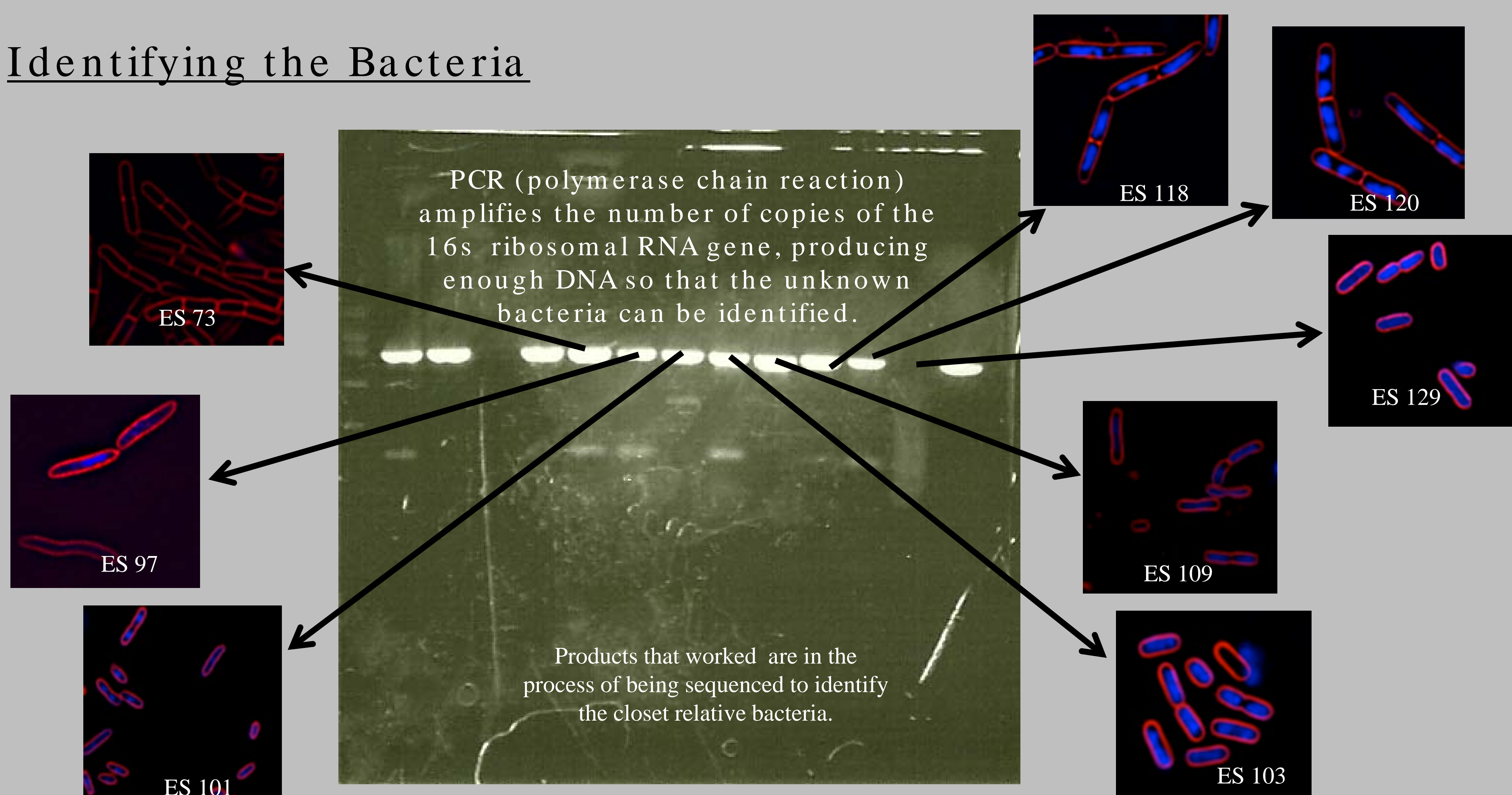
## INTRODUCTION

Although very little is known about the vast world of bacteria, which is known to be much bigger in population than human life, microorganisms have given people the gift of natural products. Important antibiotics such as tetracycline, erythromycin (used to treat bronchitis and other bacterial infections), vancomycin (Vancocin), beta-lactams (penicillin), cephalosporin (used to treat pneumonia), and rifampicin (used to treat tuberculosis) have been discovered by isolating bacteria from samples of soil. Scientists have studied the lives of bacteria and how they behave around each other to better understand what causes these organisms to produce such antibiotic agents. Because of the competition for food and space among other organisms, bacteria produce agents that give them advantages over others so they can survive. Among antibacterial agents, some produce drug-resisting molecules such as herbicides, insecticides, and anticancer drugs.

## Isolating the Bacteria



## Identifying the Bacteria



## Different Behaviors During Interaction with *Bacillus subtilis*

Samples that were shown to respond greatly to *M. luteus* and *hag-lacZ* strains were then spotted next to drops of *Bacillus subtilis*, or 3610. Different behaviors were seen after 24-72 hours of incubation. Their individual cells were photographed to see the differences in structure.

**“Co-existing”**  
ES 129 and 3610 co-exist next to each other, with no appearance of change from either colony.

The cells look like a gram negative cell due to its more round shape.

**“Overwhelmed”**  
3610 looks like it is overwhelming ES 10 by growing on top of it.

The cells of ES 10 seem rigid, like gram positive cells. I identified this species as *Lysinibacillus fusiformis*.

**“Running Away”**  
ES 7 seems to be steering its growth away from 3610 to avoid contact with the colony.

**“Repelling”**  
ES 73 seems to be emitting an anti-bacterial layer that is causing the normally circular shape of 3610 to distort into an oval.

These cells look like they have a thick and rigid structure, making them gram positive bacterial cells.

**“Killing”**  
In the first sample of ES 97, 3610 seems to be secreting molecules that is causing ES 97 to die out.

The cells of ES 97 look like vibroid, or curved cells. They are most likely gram negative because of their smooth and circular cell poles.

**“Invasion”**  
In the second sample of ES 97, 3610 looks like it's completely invading the ES 97 colony and causing ES 97 to showing some of the characteristics of 3610.