**Introduction**

Regardless of your experience level with programming or the solutions you support, I guarantee that there is a use case to know Cerner Command Language (CCL). It doesn't matter if you are a Pharmacy, Core, HIM, or Lab analyst - knowing enough CCL to be dangerous will significantly increase your productivity, troubleshooting ability, and overall knowledge of the system.

For those of you who have a solid programming background, and perhaps some CCL knowledge already, the advanced sections of this book will save you literally thousands of hours throughout your career. The skills you will learn in these sections apply to any Cerner Millennium module and for anyone looking to become a report writer.

This is far more than just a programming book. If you read this book cover to cover you will understand the underlying mechanics of Cerner Millennium. This will allow you to write a script to do anything you want.

Here are just a couple of the areas that CCL can be applied to make your life easier:

-build validation

-troubleshooting

-data extraction

-research

-report development

-workflow automation

-build automation

-foreign system interfaces

-discern expert (rules)

The goal of this book is to help you learn as fast as possible and save as much time as possible. I have cut through all the weeds of learning a programming language for the first time (especially if you have no programming experience) and only show you what you need to know in the order you need to know it.

This is not a reference book. I'm not going to waste your time by listing the hundreds of functions and concepts you *could learn*. I'm going to teach you how to program in CCL, how to use the functions that are important, and how to find the data you need. With this skill set, you will be able to apply your knowledge to any solution for any purpose whether it be simple troubleshooting or advanced mPage development.

Programming is not an easy task. In a sense, you are creating your own maze, and at times, especially at first, you might just get lost in it. There will be times when reading this book that you become terribly frustrated. If you are new to programming, there is a lot of material to digest. As you progress, much of this material will be *combined* with new material that require you to make additional connections.

It is up to you to make the necessary effort. If you are struggling to follow the book, do not jump to any conclusions about your abilities or compare yourself with anyone else. Simply take a break, reread the material and try again. Make sure you understand every program and every exercise before moving on.

Learning CCL is hard work. However, when you get to the point where you spend less time writing queries to pull data compared to the time it would take looking up the same information in a front-end application, you will have succeeded.

**What is CCL?**

Cerner Command Language (CCL) is a full-featured programming language patterned after Structured Query Language (SQL). In the mid 1900's the name was changed to Discern Explorer, but CCL continues to be referenced throughout Cerner Millennium. The names are interchangeable, but for the remainder of this book I will be using CCL.

All Cerner Millennium applications use CCL to select from, insert into, update into, and delete data from the Millennium database. CCL is used to initially write all of the information you see in any front-end Millennium solution (e.g. PowerChart, PHA Med Manager, or Order Result Viewer) to the database and display what you are seeing in the application. Since every Cerner Millennium solution uses CCL to read and write from the database, you can use CCL in an endless number of ways to do the same thing.

Cerner provides a front-end integrated development environment (IDE) called DiscernVisualDeveloper.exe (DVDev) that allows you to create and execute ad-hoc queries, fully-fledged programs and reports. DVDev can also be used to create and edit source code. It combines text editor functionality with Cerner's data dictionary and efficiency tools. It allows you to lookup tables and code sets, review fields that exist on tables, build prompts, forms and layouts for reports, and much more.

Cerner also has a CCL utility that can be run from the back-end that we will be discussing in depth, and there are a number of third party programs designed to help make writing CCL easier.

DVDev is a front-end integrated development environment (IDE) that can be used to create and edit source code. It combines text editor functionality with Cerner's data dictionary and efficiency tools. It allows you to do table and code set lookups, review fields that exist on tables, build prompts, forms and layouts for reports, and many other things.

Compiled CCL programs are stored in the Discern Explorer Object Library, known as the dic.dat. These programs can be executed from Millennium applications, through a DVDev session automatically scheduled in OpsViewScheduler.exe, by Discern Explorer Rules, as mPages from PowerChart or as an API through MillenniumObjects.

**How to use this book**

Every chapter in this book contains a lot of code. I believe reading code and more importantly writing code are indispensable parts of understanding how to program. Do not just glance over the examples - write them out and digest them. ***Do not simply read them***. This will likely be slow at first, but you will quickly get the hang of it. The same goes for the exercises. Don't skip over them and don't assume you understand them until you write a working solution. If you happen to get stuck, review the answer in the back of the book and try again.

In many cases, examples explain concepts better than words. If you skip over the examples, *you will* miss a lot of information.

Unless you already have a very solid understanding of a particular topic, don't skip any sections. Each section in the book builds upon the previous one. The entire book is a story that will teach you all of the important concepts you will need to know, and to understand many concepts, you need to understand preceding information. Skipping a section will deprive you of the necessary understanding.

All of the code within this book, along with 100’s of other real-life examples, is stored on my Github repository.

<information on how to access it>

**Overview of this Book**

This book contains three main sections. The first section discusses databases and how they work, how to use Cerner's tools (and other third party tools users have developed) to write CCL, how to structure queries, and how to join tables.

The second section discusses persisting data in variables, record structures, using condition statements, loops, and Cerner's Report Writer sections. After you have finished this section, you should understand all of the necessary concepts to write just about any program you would ever need to write.

The final section covers finding the data you need. You will learn about tools like CCLPROT, CCLGLOS, MTA, RTL Server logging, Trace logging parameters general performance tuning and advanced troubleshooting.

Throughout the book, there are five *project chapters*, which describe larger, real-world examples to give you a taste of actual programming and troubleshooting.

Good luck!