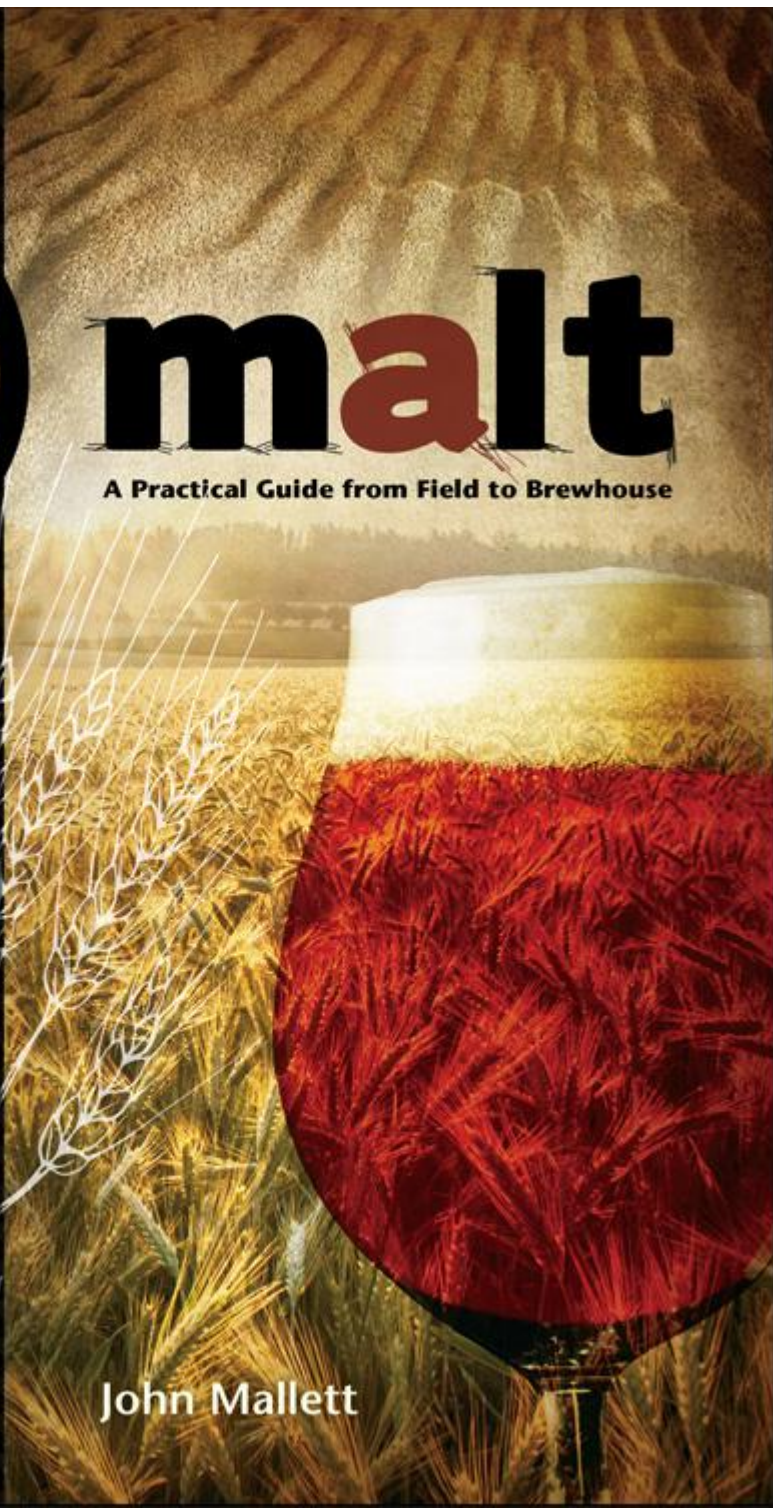


BREWING  
ELEMENTS  
SERIES



# malt

A Practical Guide from Field to Brewhouse



John Mallett

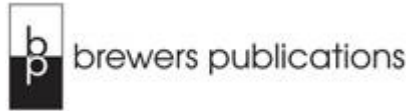


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To my family: Linus, Kat and Maggie.

This work is evidence of your unwavering support and patience; thanks for making it possible.





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## Acknowledgments

Writing a book was a stretch for me. I am an inefficient writer and easily distracted. Quite simply, this book would not have been possible without the tremendous patience of my publisher, Kristi Switzer. Her constant encouragement and gentle prodding have helped to fundamentally shape this work. Over the past two years, as this book slowly came together, she was an indispensable asset, guiding me through the pitfalls of writing. Too often, the competing pressures of work and family pushed writing to the back of the line. She gently kept me on track, encouraging and supporting me, finding resources when they were most needed.

It was she who suggested John Palmer to help with the content of the book. In addition to his thorough technical edit, his assistance clarifying certain sections has been more than generous. Joe Hertrich, *Malt's* other technical editor, has been a source of information about malt for many, many years. His willingness and ability to share knowledge is greatly appreciated. Thanks to Oliver Gray for editing my writing, and Iain Cox who provided direction at a crucial time.

The Bell's family—Larry, Laura, and the entire staff—have been incredibly supportive over the many years I have had the pleasure of working with them. That support has provided me the chance to dig deeply into barley and malt, and made this book possible. I'd also like to offer a special thanks to the Bell's malt team: Ed Ruble, Andy Farrell, Andrew Koehring, and Rik Dellinger. You guys are awesome.

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Andrea Stanley of Valley Malt pointed the way to some fantastic resources. She is a fellow malt history nerd, and with her husband Christian, is helping to reshape the small-scale malting landscape in the US. Their enthusiasm for malt is absolutely infectious, and it is a pleasure to know and work with them.

Researching this book has been an absolute dream. I had the chance to interact with plenty of smart and passionate people who gave valuable insight over the years. They include (in no particular order): Mike Turnwald, Dave Thomas, Chris Swersey, Matt Brynildson, Jennifer Talley, Wayne Wambles, Jonathan Cutler, Tom Nielsen, Pat Hayes, Paul Schwarz, Bruno Vachon, Dave Kuske, John Harris, Peter Simpson, Susan Welch, Mary-Jane Maurice, Bill Wamby, Alec Mull, Joe Short, Clay Karz, Alex Smith, Mike Davis, Scott Heisel, Sean Paxton, Yvan de Baets, Dan Carey, Gordon Strong, Scott Dorsch, Bret Manning Van Havig, Jace Marti, and Eric Toft.

By my side throughout this project has been another set of inspiring people who I have never actually met. They are the authors that have written so extensively and astutely about malt, chief among them Dennis Briggs (*Malts and Malting*) and H. Stopes (*Malt and Malting*).

Thanks to everyone for the opportunity and the journey; it's been a blast.

-John Mallett



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## Foreword

For decades, John Mallett and I have crisscrossed and intersected each other's careers like the warp and weft of burlap malt sacks. I first met John (virtually) when I was working in Chungcheongbuk-do, South Korea, commissioning the new Jinro-Coors tower malthouse in 1993 (where, at times, I marveled at 100 pound men carrying 100 pound sacks of local barley up the steps at the loading dock). During the "spare" time that came with the hurry-up-and-wait activities of new plant commissioning, I co-authored (with Professor Sir Geoffrey Palmer) a few articles about malt for the March-April 1994 *The New Brewer* magazine. John was technical editor for *The New Brewer* then, so my articles ended up in his inbox.

After returning to the US, I would periodically bump into John at various brewing functions. He was assisting several different breweries in Colorado and elsewhere, while I continued working for Coors in assorted R&D, malting, and brewing posts around the world, until I retired in 2007. John scaled up in brewery size and position, and is now Production Director at Bell's Brewery in Kalamazoo, Michigan. Bell's is a large, regional craft brewery that grows its own barley for malting. He also teaches at Siebel Institute of Technology and writes technical articles on all aspects of brewing.

Recently, our paths crossed again when we realized we were both writing books about malt. Mine, *The Craft*

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*Maltsters' Handbook*, recently published by White Mule Press (Hayward, California), and John's book published by the Brewers Association (Boulder, Colorado). When we bumped into each other at the 2014 Craft Brewers Conference in Denver, I asked John about possible redundancies between our two projects. He heartily replied, "don't worry; yours is written from the maltster's point of view and mine is the brewer's perspective. They will complement each other!" He was right. They do nicely.

John talks about the "heavy-lifting" that malt does for brewers. In this book, John has done the heavy lifting for us by presenting (in a very readable fashion) the chemistry of malt carbohydrates, sugars, amino acids, proteins, and lipids. Throughout the book, he elegantly describes the history and chemistry of Maillard reaction products, derivation of caramel colors and flavors in the kiln and kettle. John pulls from his own experience as a brewer, and brings in several other notaries from the craft brewing and production malting worlds to emphasize the important and sometimes surprising practical aspects of using malt to make beer. The book flows like the air moving through drying barley, describing functionality, flavors, fermentability and unfermentables extracted from malt, including how many malty factors can be unintentionally over-represented in beer. As John discusses brewing recipe formulation, one brewer he interviewed compares the process to painting. Color, depth, and brushstrokes can be just like the different qualities and quantities of malts. Other brewers think of their brewing formulae as

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musical compositions, with different malts providing bass, middle, and treble notes.

Doing research for the book, John went on many enviable visits to malt-houses and breweries around the world and neatly tours us through them. In reviewing the history of malting, John tells us about Harry Harlan, the “Indiana Jones” of barley. He tells us about the ongoing search for the next “Maris Otter” of malting barley varieties. The different styles of standard and specialty malts are introduced, and most importantly, critiqued from several brewers’ perspectives. He shares his and others’ “teachable moments of near catastrophe” in handling and brewing with different malts over the years. In addition to the malt itself, he addresses common concerns related to malt receiving, conveying, storing, weighing, and milling. You won’t find that level of fundamental understanding and practicality in any malting theory textbooks.

In the late 1970s, when the first craft brewers were turning their homebrewing hobby into commercial businesses, Bill Coors called several of us into his office. He said that we would probably be getting technical requests from small, startup breweries and when we did, we were to “get on an airplane and go.” So we did. Many of us drove, flew, or answered questions by phone whenever asked. One of the first instances I remember was from a fledgling Colorado brewer that appeared wide-eyed in my office carrying a casebox full of milled malt, asking why they couldn’t get good extract and run-offs from their malt. This one was dead easy. I scooped up a handful from the box and



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