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BEER: A LECTURE



*(Tasting
Included)*

Sergey Konstantinov. Beer: a Lecture (Tasting Included).

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Beer. The most modest and unassuming beverage, a filler for supermarket shelves. At the same time—a staple of the economies of many nations for millennia. Egyptian pyramid builders were paid with it, polar explorers took it to the North Pole as life-sustaining support, workers of Brussels once rioted because its price was up by two centimes.

In this book, a centuries-long beer history is told in a comprehensive, interesting, and *practical* manner. You will learn which beer styles were popular in each epoch, from Bronze Age to the 21st century, understand the reasons why, and, which is the most important, explore the history by taste.

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PREFACE

Chapter 1. Author's Note

The history of beer and brewing was always a practical study to me. I was always keen to try something new—and not just try, but learn from it: when this beverage occurred and why its tastes like this. Gradually, I involved myself in studying beer history and soon found that brewing is now one of the hottest topics of historical science.

For many centuries in northern parts of Europe beer was if not the first economy sector then at least second—the fact which both Medieval chroniclers and contemporary scholars turn a blind eye to. Up until 1980s the researchers were interested in the history of alcohol only in a context of consumption effects on personal and public health¹. But as we all well know, alcohol, a ‘social lubricant’, plays a much greater role in society! Gradually, this fact reached academic studies. In the case of beer, it happened even later, at the beginning of the 21st century. It turns out that beer, an ordinary and democratic beverage, allows us to poke our noses into the most interesting and least documented part of the past: the daily routine of common folk.

Making one's way through beer history is incredibly fascinating—and equally challenging. Eyewitnesses didn't care about writing down such obvious and mundane things as beer brewing. Historical science made huge progress over many mysteries last years, and craft beer reenactors recreated lots of historical beers

for everyone to taste. But our knowledge is still miserably sparse regarding many aspects and events, even quite novel ones.

While writing this book I hadn't pursued a goal of compiling some short beer history. First, it's impossible; second, I'm no scholar but a beer enthusiast. All I want is just acquaint you, dear reader, to good beer, and tell an interesting story along the way. Let us begin!

An Important Remark

This book is written as a lecture-tasting. In each chapter, we're proposing to try a specific kind of beer matching the historical period described. Full description of how to read classifications and where to learn about suitable beer styles you may find in the Appendix.

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Chapter 2. What is Beer

Before describing the history of beer, we need to define what 'beer' is. Natural alcoholic beverages are a result of the biochemical process of alcoholic fermentation: various microorganisms (primarily yeast, but not only them) are capable to extract carbohydrates (first of all, sugars) from aqueous solution and break them down, producing ethyl alcohol and carbon dioxide, as well as some other organic compounds. Carbon dioxide makes the resulting drink sparkling; ethyl alcohol, interesting to humans.

Depending on what raw materials were used and what kind of sugar was fermented, the resulting beverages are called differently:

- if the raw material is grapes (or other fruit), juice of which contains a large amount of glucose, then the result of fermentation is called wine;
- if the raw material is apple (or pear) juice containing glucose and malic acid, then we get cider (or perry);
- if milk sugar lactose has fermented, then we get kumis;
- if we take honey rich in fructose saccharide as raw material, we will get mead.

It's interesting

A sucrose solution also quite fits for the manufacture of low-alcohol beverages in the form of sugar cane juice, but humanity started to cultivate it for this purpose quite recently. At that moment the distillation technology was already known, and just strong drinks were produced, rum and cachaça for instance. The product of natural, without the use

of distillation, fermentation of sugar cane is known in some countries under the name 'guarapo', being in very limited demand.

Finally, if sugars extracted from cereals are used for fermentation (first of all, we are talking about the disaccharide maltose), then the resulting low-alcohol drink is called 'beer'. The grain of many cultivated plants, such as wheat, barley, maize, rice, rye, oats, millet, buckwheat, and others is suitable for beer production. Thus, such drinks made from cereals as Russian kvass, Finnish sahti, and traditional Japanese sake should also be considered 'beer'.

Our distant ancestors, presumably, discovered the fermentation process by accident: it was enough to leave the water with grain in the open air so that the wind inoculate it with wild yeast. A few days at the right temperature — and you will get a refreshing low-alcohol drink.

The age of the known remains of fermented sugars is steadily moving further into the past. At the moment, the oldest such finding dates back to about the eleventh millennium BCE¹. Thus, beer and mammoths were there at the same time for at least nine thousand years! Some researchers believe that beer may be older than bread: getting beer is easier than baking bread. But we would disagree with them, for two reasons.

First, cereals themselves contain little to no low-molecular carbohydrates: the main component of grain is starch. To get maltose or glucose out of it, you need to somehow activate the processes of converting starches into saccharides. For example, you can chew rice: the enzymes in saliva help to start the processes of converting starch into glucose. This is how traditional Japanese

sake *kuchikamizake* is prepared (not to be confused with modern sake, the production technology of which we will explain in the chapter ‘At the dawn of civilization’). If you have wondered why the heroine of the ‘Your Name’ movie is chewing rice, that’s it: she was producing traditional sake.

It is believed that the *kuchikamizake* technology (which was used not only by the Japanese but also by South American Indians, for example) is about 2.5 thousand years old (although we have not seen credible studies on this topic). Therefore the oldest beer was prepared somehow differently. To ‘activate’ the cereals some specific process is required. For example, bread was baked or *malt* was prepared. The latter is a product of controlled sprouting: during the germination of grain, enzymes are produced. These chemical compounds are capable of converting starches into maltose under the right conditions, and such grain becomes suitable for the production of a beverage, which we call ‘beer’.

Another problem of beer production is the necessity to somehow introduce yeast into the solution. You can, of course, rely on sheer luck, but this method is poorly applicable for large-scale production. In order for fermentation to begin, a ‘starter culture’ is needed. It can be fruits (such as grapes or dates), on the surface of which yeast lives in the wild, or baked bread, or yeast sediment from previous cooking.

Based on this, we strongly doubt that ancient beer was produced by accident: ‘accidental’ beer should have been obtained too rarely and being too weak, unlike, for example, fermented milk or fruit juices. Brewing was exactly a *technology*, one of the first mastered by mankind².

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FROM SUMERIANS TO SADI CARNOT

Chapter 3. At the Dawn of Civilization

Historical period: from the 10th millennium BCE to the 2nd century CE

Scene of action: Mesopotamia, Egypt, China, the Mediterranean

The Sumerians are widely regarded as the first civilization in human history. It was likely Sumerians who invented writing. And — what a coincidence! — they were also huge beer lovers. In the oldest clay tablets, dated 30-32 centuries BCE, beer is already mentioned as a staple product, manufacturing of which was controlled by the state¹.

Sumerians loved beer so much that they have a separate beer goddess: Ninkasi. ‘A Hymn to Ninkasi’², dedicated to the goddess, is itself an allegorical beer recipe, according to scholars³. The Hymn was written down circa 18th century BCE, but researchers suggest it’s much older than that⁴. Apart from the Hymn, beer is also mentioned in one of the oldest Sumerian legends, ‘Inana and Enki’⁵.

There are many surviving images of people drinking beer (supposedly) from mugs or large vessels by the means of tubes⁶. Furthermore, it’s the oldest known depictions of cocktail straws⁷, so it’s quite probable they were invented specifically to drink beer.



Two sitting figures drinking from vessels by means of straw. 2600–2350 BCE

Image Credit: The University of Chicago

Babylonians, Akkadians, Ancient Egyptians — all these peoples adopted a taste for beer from Sumerians⁸. In the oldest of surviving epics, namely 'Epic of Gilgamesh', beer is mentioned in a very peculiar aspect. According to the myth, goddess Aruru created a 'wild man' Enkidu to confront Gilgamesh. But then Shamhat, a sacred temple prostitute, seduces Enkidu and civilizes him. To do so, she makes him eat bread and drink beer: the symbols of civilization, unknown to wild men⁹.

Then beer is mentioned in the Epic once more¹⁰: goddess Siduri advises Gilgamesh to abolish his quest of seeking the meaning of life, and just enjoy small wonders — like beer. This character, Siduri, is considered to be the first written mention of 'alewife', e.g. a female brewer-bartender-tavern keeper¹¹.

One of the first codes of law in human history, the Babylonian Code of Hammurabi, refers to beer four times¹²:

- §108: if a tavern keeper pours short of the paid amount of beer (or refuses to take grain as a payment), then she shall be drowned to death;
- §109: if a tavern keeper fails to report the powers about the planned coup which was discussed in her tavern, she shall be put to death (a method of which remains unspecified);
- §110: if a ‘Sister of God’ (e.g. the high priestess) runs a tavern or just enters one to drink beer, then, as you should have guessed, she shall be executed;
- §110: if a tavern keeper donates sixty *ka* of beer in the time of famine, then she shall be awarded fifty *ka* of grain afterward.

Let us point out that the Code refers to tavern keepers as females, and all the corresponding goddesses and legendary characters are females either. From the beginning of civilization up to the industrial revolution preparation of alcoholic beverages as a whole, and brewing beer in particular, was predominantly women's job¹³, with an exception of Christian male monasteries¹⁴. It appears that brewing and baking were not decoupled from each other, it was essentially the same occupation.



Model bakery and brewery from the tomb of Meketre, an Egyptian noble, chancellor to Pharaoh Mentuhotep II and several of his successors. Circa 1981–1975 BCE

Image Credit: The Metropolitan Museum of Art

In Ancient Mesopotamia, beer was something like a currency¹⁵. Daily workers (builders of the Giza pyramids, in particular) were paid in beer — something like 4-5 liters per person per day¹⁶.

How to Try

The distinguished researcher of ancient civilizations' cuisine, prof. Patrick McGovern, managed to find traces of Egyptian beer and recreate it¹⁷. In collaboration with Dogfish Head Brewery the 'Midas Touch' beer, based on the recipe, was prepared. This is not the only attempt: another brewer, Fritz Maytag (of whom we will tell much more later) considers the procedure described in 'A

Hymn to Ninkasi' so obvious that he brewed beer based on it and presented it at the annual meeting of American Homebrewers Association in 1991. Maytag hasn't released it commercially, since the technology doesn't preclude using preserving agents; other brewers are not so picky. Today, beers brewed according to ancient recipes (Sumerian, Egyptian, Celtic, Etruscan, etc.) are available in numbers. The most famous examples are:

- abovementioned Dogfish Head Midas Touch;
- Williams Bros. Fraoch, possibly the most widespread brand, based on an ancient Celtic recipe (might be found as a part of the 'Historical Ales of Scotland' set);
- Thornbridge Hall Bracia, analogous Celtic beer from the neighboring brewery;
- another ale prepared by McGovern & Dogfish Head, Kvasir (recreated using the remains of 15th century BCE beer found on the territory of nowadays Denmark);
- Posca Rustica by Brasserie Dupont, based on 1st century CE Roman recipe;
- Birra del Borgo Etrusca, after Etruscans.

There is no specific name for such 'elder' beer; look into 'Ancient Herbed Beer' and 'Traditional' categories.

Nevertheless, we consider these reconstructions being a bit deceiving; in many cases, just a wild fantasy on historical themes. Let us name three reasons which make us think so.

Let's start with the Sumerians. The situation there looks paradoxical: we are well aware of many kinds of Sumerian beer (clay tablets mention 'Gold', 'Dark', 'Sweet Dark', 'Red', and other types), and we knew all ingredients of these beverages. But have

totally no idea what these ingredients actually were, and how these beers tasted¹⁸.

Writing (cuneiforms on clay tablets) was expensive, so it was used for *important* things, like every kind of administrative orders: deliver these amounts of those ingredients from point A to point B to make that amount of beer¹⁹. It went without saying that the receiver totally knew how she would brew the requested beverage, so nothing like precise recipes or brewery blueprints survived²⁰.

Even basic facts are actually a set of assumptions. There are two main ingredients mentioned in all listings: *bappir* and *munu*. The former probably means barley bread (though it's measured in volume units, like something which might be poured), the latter should be barley malt²¹. That's actually all we know more or less reliably.

The oldest surviving beer recipe was written down by an Egyptian alchemist Zosimus in the 4th century CE (which is several thousand years after the heyday of ancient brewing), and, possibly, not by Zosimus himself, but an unknown later scribe. The recipe prescribes soaking then drying barley, preparing a half-baked bread from it, soaking it again and leaving liquids to ferment²². No other details like amounts and types of ingredients or further actions are provided. It's also vexing that Zosimus recipe contradicts archeological evidence, so considering it genuine is a bit of an overstatement²³. That's the first reason why authentic beer reconstructions are not possible.

Of course, we can still brew *some* beer based on this recipe or archeological findings. But there are also second and third reasons.

Modern beer is basically brewed using four components: grain, water, yeast, and hops. As we will explain in the next chapters, none of these ingredients existed before the High Middle Ages. Yeast was strictly airborne, e.g. 'wild', and we don't know the exact species. Cereals that were prevalent in Ancient Mesopotamia and Egypt, namely emmer, spelt, and einkorn, were half-domesticated ancestors of modern wheat; ancient barley was a distant relative to modern barley either. Beer was sweetened and spiced with some flavor additives which we know nothing of. Finally, water in Mesopotamia was a rare commodity being very far from crystal clarity. Some reenactors choose similar (as they think) modern ingredients; some of them try authentic cereals. But no attempt to precisely reconstruct all four components has ever been made, as far as we know²⁴.

And there is also a third reason, probably more important than the two previous ones. For industrial beer production, the technical parameters must be controlled with extreme precision, right up to degrees and per mills. Until the 18th century when the thermometer and the hydrometer were invented, brewer's control over the processes of mashing, cooling, and fermenting was quite limited. Many factors, like weather or microorganisms, were totally out of their control. So ancient beer hasn't had 'a taste': each batch brewed under some specific conditions had its own specific taste. Master brewers were probably able to produce the more or less consistent product; less skilled ones were preparing totally unique beverages each time, but constantly sour and cloudy. We can only agree that, according to the big numbers law, sometimes they must have brewed something close to a liquid we have just filled our glass with.

Decline of Ancient Beer

During the Bronze Age, beer was the most common beverage to almost every civilization, from the Sumerians to the Chinese. But in the 1st millennium BCE, the situation changed dramatically.

In China, supposedly under the rule of the Shang dynasty, circa 15-16th century BCE, a new method of producing alcoholic beverages from rice was discovered. A complex mixture of molds, yeast, and bacteria, known as 'qū' (麴 in traditional Chinese), cultured on a starch-rich substrate, is able to convert cereal starches to alcohol directly. The result is a rather strong beverage containing 8 to 20 percent alcohol by volume (ABV). Many traditional Eastern alcoholic beverages, such as Chinese 'rice wine' *huangjiu*, Korean and Japanese *sake* and *shochu*, are produced using *qū*²⁵. This technology superseded beer brewing in the East, but for obvious reasons (the secrecy and lack of rice) were not adopted in the West.

But the West — Ancient Greece and, later, Ancient Rome — had their own technological know-how: grape wine. Archeological evidence indicates that it was already produced in 6-7 millennium BCE on the territory of nowadays Georgia (and probably in China either), but it was Phoenicians who spread the taste for wine through all the Mediterranean²⁶.

Some scholars believe that late Bronze Age Greeks (Mycenaeans) inherited brewing traditions from their Minoan predecessors, and therefore drank beer or at least tolerated beer; maybe Dionysius was a god of beer and mead as well as wine²⁷. However, starting from the 10th century BCE beer completely disappears from the Greeks' diet and is mentioned in written sources as a 'foreign beverage' — of Thracians, Phrygians, Egyptians. To Ancient Greeks beer was a beverage of northern 'barbarians' Thracians and Peons²⁸. In the 5th century BCE, Aeschylus in his plays

counterposes ‘Dionysius beverage’ (e.g. wine) against ‘Thracian beverage’ (e.g. beer). Many other Greek dramatists had started to despise beer after Aeschylus²⁹. Greeks believed that beer as a result of ‘decay’ of grain, in turn, makes humans decay, and also effemulates men. This opinion, voiced by Theophrastus³⁰, is to be repeated constantly in the Ancient Greek and Roman literature. Beer was associated with excessive alcohol consumption attributed to Scythians and Thracians, while Greeks themselves were (of course!) considered being inherently modest and temperate.

As a result with Ancient Greece then Ancient Rome influence growth beer was universally dislodged³¹. Peoples living on a territory of nowadays France, Spain, Northern Italy, Germany had been drinking beer for millennia before wine and viniculture arrived on their soil³², but during the 2nd and 1st centuries BCE, Romans progressively defeated all beer-drinking nations: Celtiberians, Gaul, Carthaginians, Ligurians, Egyptians. Even Celts started to prefer wine under Roman influence³³. Wine prominence was also enforced by the swiftly spreading Christianity, which gave it a very special position in its rituals and sacred books. At the beginning of the Common Era, the only keepers of beer tradition in the world were the ‘barbarians’ on the outskirts of the Roman Empire.

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Chapter 4. The Barbarian Booze

Historical period: the 2nd — 10th centuries CE

Scene of action: Europe north of the Apennines and the Pyrenees

Paradoxically, it was Romans who left a lot of material evidence related to beer production. At the outskirts of the Empire, brewing continued on, both for locals and Roman legions they hosted. In the remains of Vindolanda (a Roman outpost in England) a letter (inscribed on the wooden tablet) was found: Masculus, a decurion (head of a cavalry platoon), tells Flavius Cerialis, a prefect, that the soldiers have no beer (*ceruesam*) and asks for sending some¹.

On the territory of nowadays Germany, Great Britain, and Belgium a number of Antic breweries were found. One of the oldest is located near Regensburg and dates back to the 1st-2nd centuries CE. It is notable not only for being the first known Roman brewery on European territory but also as the earliest evidence of using *kilns* for malting².

Remember that barley itself doesn't suit brewing purposes well since it lacks fermentable sugars, so grain undergoes *malting* procedure: it's soaked, then allowed to germinate. The result of this operation, known as 'green malt', might be used for brewing directly, but it perishes very quickly. So green malt is usually dried, and in this form, it might be kept quite well for a long time.

In Mesopotamia and Egypt, malt was presumably dried in the sun, since it's quite hot and sunny there. In the Northern Europe conditions, drying malt in the sun was not an option. Alternatively, malt might be wind-dried, but that requires specific conditions either. So, in Europe, they started heating germinated grain in large ovens named *kilns*. A kiln was usually a stone chamber with a hearth in it. The malt was spread on the floor, and then the fire was kept low for several days.

How to Try

How this late Antic beer tasted is very hard to say because no written sources survived. Several Roman writers mentioned beer (most notably, Pliny the Elder in his 'Natural History'), but they probably didn't know anything about brewing in detail and weren't actually interested. Technically, the Zosimus recipe we mentioned in the previous chapter falls into the discussed period of time, but it describes Egyptian technology. As for European beer recipes of late Antiquity and early Middle Ages, we know almost nothing³.

However, the mere fact of using early kilns gives us an opportunity to taste the past, so to say. Nowadays the same technology of smoking malt with beech wood is used to produce a special style of German beer called 'Rauchbier' (and 'island' whiskeys). Rauchbier is totally not authentic from all other points of view, as modern barley, yeast, and hops are used to produce it. But as you instantly understand after the very first sip, it's a hell of a taste, hardly manageable to get rid of. So from the tasting perspective, *Rauchbier* is the best approximation of late Antic 'barbarian' booze. (Conversely, modern reenactors that restored Celtic kiln of the

4th-5th centuries CE say that it was naturally a Rauchbier clone they've got from it⁴.)

Widely known beer in this style is produced by the Schlenkerla company (there are several distinct brands, any of them will fit). Also, a few craft breweries produce 'smoked' beer, for example, Dutch 'De Molen' ('Bloed, Zweet & Tranen' and 'Rook & Vuur' beers).

The Time of the Cathedrals

A significant part in spreading brewing in Europe was played by Christian monks and priests. Beer 'promotion' already started in a time of the Roman Empire in Ireland, which wasn't under Roman rule. In the 5th century CE, Saint Brigid of Ireland was already converting water to beer, according to legends⁵.

Monks' interest in beer was quite understandable in those regions where cultivating grapes wasn't possible. Because of numerous strict fasts, they needed an additional source of calories like no others did⁶. Beer popularity in monasteries was additionally promoted by Louis the Pius who started enforcing so-called 'St. Benedict's Rule' on the territories he controlled, in accordance to the will of his late father, King Charlemagne⁷. The 'Rule' is a set of regulations for monks created in the 6th century CE by Benedict of Nursia. The Rule prescribed monasteries being self-sufficient, and therefore producing everything their residents needed in place. Furthermore, monks were obliged to provide meals and shelter for travelers.

It's frequently stated that monasteries produced the largest share of beer in the Early Middle Ages, but it's highly likely not true. Brewing beer was a regular activity for Middle Age households, something quite similar to baking bread. But common people haven't left any written evidence of their everyday life while monasteries were documenting their operations extensively⁸.

How to Brew Beer

Let us describe a technological process of brewing beer as it was developed in Medieval Europe and has reached our days almost unchanged.

1. First, the raw materials (e.g. malt) need to be crushed. The grinding must be rather coarse, not flour-like fine.
2. Ground malt is mixed up with water (the process known as 'mashing') and is heated up to approx. 70 degrees Celsius. At this temperature, enzymes that are present in malt convert starches to sugars. Then the solution is being filtered out, and pure malt liquor called *wort* is prepared.
3. If beer is brewed with hops (see the 'Word on Hops' chapter), then the wort after mashing needs to be boiled with an addition of hops cones for an hour or two. Sometimes wort is boiled additionally to achieve a specific taste according to a recipe.
4. Then fermentation starts. Some starter is added to wort (often additionally filtered), or it just gathers the microbiota from the air. Depending on the microorganisms type and external conditions (like temperature or oxygen access) fermenting

lasts from 2-3 days up to several weeks and more. During this time yeast break down sugars and produce lots of chemical compounds — notably, ethyl alcohol and complex ethers. Which substances in which proportions are left after the fermentation defines the taste of beer. Other microorganisms compete with the yeast for edible sugars, first of all, *Pediococcus* and *Lactobacillus*. If they oust yeast, beer will sour.

5. Technically, beer is ready for consumption at any moment, though usually brewers wait until the fermentation ends. High-quality beers are usually being left to mature for an extended period of time, up to several months or even years.
6. Some beers continue fermenting in barrels or bottles. To enforce this process, fresh yeast and additional sugar source are added.

At stages 4-6, beer might be additionally spiced with flavor additives, including hops (so called 'dry hopping').

Until the 20th century, the raw materials were used several times, e.g. after the first mash is complete and the wort is filtered out, the malt remains were mixed with a new portion of water and mashed again and again, up to five times. The first wort was used to produce the best and strongest beer, while secondary worts were used to make cheap and weak 'small' or 'table' beer.

The most important parameter of wort, directly affecting beer qualities, is its original gravity. It's usually measured as wort to water density ratio and is denoted with an 'OG' abbreviation. The more thick is the wort, the more alcohol could the resulting beer contain (approximately 1% ABV per 1% of density, e.g. wort with OG=1.05 might be used to produce 5% ABV beer). Another

important parameter is final gravity (FG): not all wort components are fermentable, and fermentation might be incomplete. The higher FG is, the more sweet and thick is the resulting beer. And vice versa: the closer to 1 is FG, the fewer non-fermented compounds remain. The ratio, which amount of dissolved organics were fermented into alcohol, is called *an attenuation*. The higher is attenuation, the more effective was the conversions of sugars (and the less is the final gravity).

It's interesting

The final gravity might be less than 1 because alcohol is lighter in weight than water. To produce such 'very dry' beer, either yeast and bacteria should be allowed to consume all the organics in the wort, or (more plausibly) the brew should be chemically filtered.

The easiest way to raise alcohol volume in the beverage is to increase the proportion of sugars. In pre-industrial times, honey or fruits were used; later, sugar cane syrup or (in case of cheap beer) molasses or other residues of sugar production.

The alcohol produced by yeast acts as a preservative since competing microorganisms do not tolerate its presence. However, the yeast itself can endure it up to a certain threshold: brewing beer containing more than 8% ABV requires selecting specific alcohol-tolerable yeast strains.

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