Antonio Saltini

AGRARIAN SCIENCES IN THE WEST

translated by Jeremy J. Scott

VOLUME THREE

The Course of the Agrarian Revolution

Nuova Terra Antica

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Translated by Jeremy J. Scott

In memory of my Aunt Egle,
who during my three years at secondary school
transcribed, in an endless series of exercise books
in the fine handwriting of a schoolmistress of the Eighteen hundreds,
all my Italian language essays.
The teacher claimed that by transcribing the essays with her corrections
her students would become talented prose writers:
not one of the students in the entire class ever copied out an essay,
only Aunt Egle spent pleasant afternoons transcribing my work.
After the success of my first editorial essays my teacher proudly proclaimed
that, having followed her method (moreover, in 19th-century calligraphy),
she was certain I would become a famous writer.

Nuova Terra Antica

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I
The Adventurous Life of a Scientist-Traveller

A Great Agronomist and a Pen-for-Hire

Arthur Young in a 1795 portrait by John Russell, a London society portraitist. Young's scientific renown was then at its height: three years earlier he had published his massive account of his travels through France and then been appointed Secretary to the Board of Agriculture. His prestige was such that, although Young was the author of an early pamphlet condemning the American Revolution, he could maintain an intense correspondence with George Washington; and, in spite of his warnings against the spread of the 'virus' represented by the French Revolution, letters to and from La Fayette reveal great mutual esteem.

We have already examined the work of British agronomists from the beginning of the seventeenth to the middle of the eighteenth century. However, it would be in the last decades of the eighteenth and the first decades of the nineteenth that this school of agronomy produced its most important figure: Arthur Young, whose writings would have a great influence throughout Europe.

A multifaceted personality, Young played a leading role not only in British agronomy but also in the cultural and political life of the nation; indeed, he is the very embodiment of the spirit and style of the ethical pragmatism and moral utilitarianism that informed the British Enlightenment. In a body of work whose scale beggars belief, he applies the principles which had inspired Smith's *The Wealth of Nations* to an examination of the development of British arable and livestock farming and the manufacturing industries associated with them, exploring the know-how and technology that were vital to this key sector of national wealth. An important cultural figure who reflects the society of his day, his was a life of ardent passions, illustrious friendships, violent antipathies and catastrophic economic reversals. In effect, this clear-sighted scientist embodies all the myriad contradictions of Romanticism.

Born in London in 1741, Young was the son of a clergyman who held the living of the parish of Bradfield Combust in Suffolk. As a student, his intelligence was clear – as was his impetuous temperament and changeable humour. It was while still studying that he drew up a plan for a *History of England*, which he never wrote because the money he needed for books was spent on the clothes required to fit him out for the aristocratic balls he attended so assiduously. A mere seventeen when he wrote his first political essay – on the War of American Independence - Young undertook his first publishing venture in 1761, when he founded the periodical *The Universal Museum*. Six years later he would publish *A Farmer's Letters to the People of England*; the first sign of his genuine vocation for agrarian economics, this was also his first real success, with the work being reprinted in various later editions. The most significant of these *Letters* is that containing a fiery defence of State subsidies for exported wheat, whose abolition was being called for by various authoritative voices. Young's enemies would spread the rumour that the letter had been suggested by – and received ample financial reward from – the very landowners who benefitted from such subsidies. This is the first – but by no means the last – hint that this giant of British agronomy was willing to serve as a pen-for-hire.

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Noonday Rest. Painted in the summer of 1865 by John Linnel, this depicts fields around a country house at Redstone Wood in Surrey. Due to its good transport links with the nearby capital, Surrey was one of the counties in which developments in arable and livestock farming were applied most extensively.

«You, Sir […] in your early peregrinations, […] acquired a habit, which has not deserted you upon the present occasion, of recording every thing which was told you, without discrimination, and leaving it for others to take the trouble of extracting the little that is valuable from the voluminous mass of rustic jargon which we here find committed to the press.»

As well as merely transcribing what he had been told, Young – it is argued – was also guilty of having chosen to spoke to farmers who were hardly representative of Lincolnshire as a whole; in other words, Stone points out, he tended to visit wealthy men who were agronomical enthusiasts, in whose elegant homes he enjoyed port-fuelled hospitality which offered a very distorted picture of the county. One particularly serious distortion concerned the levels of income which Young had given for the county; these, Stone insinuates, had been changed in order to please Sir Joseph Banks, President of the Royal Society and a leading light of London's cultural life, whose properties in Lincolnshire yielded rather less than would have been earned by any moderately competent landowner working the same land. Though undoubtedly inspired by resentment, Stone's comments do identify the limits of Young's massive output, in which one often has to leaf through dozens of pages before one finds an observation of genuine significance.

In Weston's Footsteps

As we saw in discussing *His Legacie: or An Enlargement of the Discourse of Husbandry used in Brabant and Flaunders*, the whole of modern agronomical literature began with a travel journal, written with the intention of identifying those agricultural practices in foreign countries that might usefully be adopted in England. The idea had initially been advanced by Samuel Hartlib, who envisaged the contents of this report being submitted to a committee of experts who might then develop the means whereby such "importation" was to be carried out, and Young's entire work would remain faithful to the type of observation and reporting championed by the German-British polymath. Against the background of an age in which British travellers crossed seas and continents in order to

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The Hayfield, an atmospheric evening scene depicting the loading of hay carts; a 1855 painting by Ford Madox Brown, one the most successful artists of the Pre-Raphaelite movement inspired by Dante Gabriel Rossetti (with whom Brown worked at the William Morris design company; his daughter was also married to Rossetti's brother, Michael, the movement's art critic). Brown's works are some of the most rhetorical of the Pre-Raphaelite School, but here he achieves a striking synthesis of clear-eyed realism and romantic atmosphere. In vast fields hedged by large oak trees, the men, animals and farm equipment are all rendered with great precision. Landscape and figures are immersed in an unreal light – more like that of the full moon than a sunset – which is one reason for the mysterious charm of the work.

The comments show almost prophetic insight into the future development of what would be the West's most important arable crop, outlining the aims that agronomical research would pursue over the coming two centuries (with the one obvious exception of genetic improvements to crops). Young has no doubts as to the "weak link" in the cultivation of wheat: the fragility of the plant's stem and its inability to bear the weight of ears of wheat which had gained in mass due to the more abundant use of fertilisers and manures. As a result of these developments, the plant tended to collapse, breaking the flow of lymph between the roots and the ear, thus impeding the accumulation of nutrients within the caryopses and exposing the grain lying of the ground to the action of fungoid parasites. The nets which he himself had used obviated this regrettable effect of richly-manured soil, allowing the plants to accumulate the maximum possible through the process of photosynthesis – a maximum that resulted in a weight that was too much for the culm beneath. Clearly, the stretching of fishing nets over cornfields was not a practice that could be adopted throughout the nation, as Young recognised. Indeed, his own losses illustrate the limits of such a remedy.

The strains of wheat which humankind had selected for cultivation over the course of millennia all shared a common feature: their height. (Ancient pictures and images show reapers moving amidst corn that comes up to their shoulders, the plants being a source not only of grain but also straw, which was an essential part of the rural economy as both animal feed and roofing material.) Apart from the strategy devised by Young, no technique made it possible to achieve yields exceeding those which had been obtained by the more diligent farmers of the past. In effect, this was a problem which would only be solved by genetics, which made it possible to develop new strains of shorter-stemmed wheat and thus obtain a plant capable, literally, of standing up to the methods devised to increase output (those very methods that Young's successors would introduce into farming). However, even though combining significantly heavier caryopses with significantly shorter stems, the wheat plants of the late twentieth century produced by such genetic research yield, per area of land, no greater weight of total carbohydrates than the maximum Young himself seems to have achieved. The English agronomist was not to know that his most successful experiments hit the ceiling imposed by the biological characteristics of the species.

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Bringing together the nation's great farmers and agricultural experts, The Royal Agricultural Society came into being as a result of wishes expressed by some of those who had participated at a livestock competition held at the great Smithfield Market in 1837. The Society's statute was drawn up in 1840 and laid down that its goal was to promote regional fairs and animal shows. Such competitions and events played a fundamental role in the development of British agriculture, the two fields in which their influence would prove most fertile being livestock-breeding and farm machinery. In fact, awards and prizes went to farming equipment just as much as they did to farm animals.

that enclosures meant that a lot of land which, under the old commons system, had been pasture now went under the plough, thus boosting the country's production of cereal crops. Furthermore, he claimed, the measure led to an increase in land rents, given that tenants would be willing to pay more for land no longer subject to the limitations imposed by traditional obligations; and in order to find the money for these higher rents, they would have to farm the land more intensively (again resulting in an increase in national agricultural output). This led on to a related assertion: that enclosures would stimulate the emergence of a more dynamic class of agricultural entrepreneurs, people who were much more willing than peasant farmers had been to make innovations. And finally, the agronomist maintained that if the same area of land was now being worked by fewer labourers and farmers, then the surplus manpower might be engaged in turning new land or else be redirected towards manufacturing activities; he calculated that England alone had some 15 million acres of unworked land, around five million of which could be used for arable farming.

With his usual legerdemain, Young is skilful in remodelling the facts to paint a picture that best suits the interests of those he is serving. For example, in the first of *The Farmer's Letters to the People of England*, he seizes upon the opportunity offered by the description which an adversary – probably an essayist in the pay of wool interests – had given of the disastrous decline in rural areas where enclosures had replaced flocks with wheat fields. While that, unnamed, writer had described the Enclosures Act as a barbarous policy, Young is quick to retort:

«A barbarous policy this! [...] Formerly it was a sheep-walk, and now it is evident from what he says of its drawing a bounty on exported corn, it is a cultivated corn country. He says, it maintained 600 manufacturers. – I desire to be informed how many people it maintains at

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A large painting by Richard Andell, which now hangs in the President's Room of the RAS at Stoneleigh, shows the various members of the Society at a 1842 meeting in Bristol. At their feet are the models of the equipment over whose design there was such lively competition amongst the agricultural engineers of the day: ploughs, hoes, and shredders for tap-root fodder crops. Within less than a decade the gentlemen in top hat and frock coats would be flocking to witness show competitions between noisy steam-driven traction engines.

present- but that piece of information makes not for his argument, and consequently finds no place in it […] It is to be considered what vast employment the very enclosing gives, and afterwards the constantly keeping the fences, gates, stiles, bridges &c. in repair; then likewise comes the employment of converting the wastes into arable farms, the variety of building necessary, the numbers requisite for tillage; and last of all, the number of manufactures […]

A tract of waste land maintains 11,000 sheep, and 600 manufacturers; the landlords, we will say, know no further of it; but reside in London, possibly, and spend scarce a shilling on this uncultivated country. They get an act for enclosing it: What a different view it immediately exhibits! A very great part of their income is spent on this vast soil, the whole neighbourhood is benefited, vast numbers of poor people are set to work, at hedging, ditching and planting –farm houses, barns, and offices are built- the makers of all kind of implements of agriculture employed, and where there were formerly one person at work, in consequence of sheep, twenty will be regularly kept by tillage.»

The entire picture is turned upside down. The novice lobbyist for wool interests had allowed that the previous aristocratic landowner might have spent nothing on his vast tracts of pastureland, but still provided work for "600 manufacturers". Young contrasts this with a glowing picture of commons that now bustle with activity thanks to enclosures; the master of "objective data" depicts the innumerable ploughmen and craftsmen for whom, after enclosure, these commons now provided work. However, the falsity of this image of a rural Eden is revealed by numerous, much more impartial, observers. One of these commentators, writing as early as 1516, was Sir Thomas More, a politician whose honesty and standing are not subject to the same suspicions as Young's. In his *Utopia*, More has this to say in describing land which had become subject to the Enclosures Act (paragraph XVIII, Book One):

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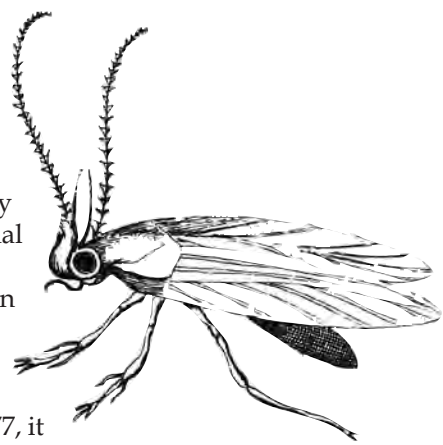
IV
The Spread of Agronomical Ideas within the Hapsburg Empire

Modern Agronomy written in Latin

Once the works of Duhamel du Monceau and Young had established what would be the key ideas of the Agronomical Revolution, those notions were vigorously disseminated throughout Europe - through translations and commentaries, and in accounts of a whole range of new experiments devised by subsequent generations of researchers to apply the methodologies they had developed. Cited with deference in any number of treatises and papers, the ideas proposed by those masters of eighteenth-century agronomy would be used to identify precedents, support hypotheses or justify original ideas advanced with all due respect and caution.

One of the most significant results of this ardent engagement in experimental research and theoretical development was Ludwig Mitterpacher von Mitternburg's treatise *Elementa rei rusticae in usum academiarum Regni Hungariae*, the most authoritative handbook on agronomy produced within the Hapsburg empire of the late eighteenth century. Published in Buda in 1777, it was written in Latin, perhaps a reflection of its origin in a multinational empire.



The third volume of the Milan Edition of Mitterpacher's work contains «*illustrations and descriptions of the various objects used in Agriculture*» – these being primarily the work of those who compiled and illustrated the Italian version. Plate XII shows various insects that are particularly harmful for cereal crops and fruit plants. Amongst the first category of pest, the most harmful are «*two small moths* [which] *lay their eggs on grain, either when it is still in fields or after it has been stored in the granaries*». The creature depicted is the insect that had been the object of masterful studies by Duhamel du Monceau and Mathieu Tillet: *Sitotroga cerealella*. The Italian draughtsman, however, is less skilful than those used by Duhamel, showing the insect with three legs than the six it should have.

The son of a modest family in Sellye (within the Baranya region of Hungary), Lajos Mitterpacher was born in 1734 and was one of that host of young devotees of learning from relatively poor backgrounds who – right up to the dawn of the twentieth century – had to look to religious ordination as the sole way of pursuing their passion for learning, be it in the arts or sciences. Having become a Jesuit, Mitterpacher alternated teaching duties in the grammar schools of Sopron and Györ with work as a private tutor; at the same time, he studied mathematics and theology and would then take his degree in philosophy at the University of Nagyszombat. Appointed to teach *economia rustica* at the University of Buda, he would also hold courses in Natural Sciences and Technology, ultimately becoming the Rector of that university in 1801. Of his numerous works, all published in Latin, more than one went on to be translated into the various languages of the Hapsburg empire: German, Slovakian, Rumanian and Italian. However, Mitterpacher's fame as a scholar and communicator of knowledge is primarily due to the *Elementa*.

This work was, for example, translated into Italian in 1784 under the title *Elementi di agricoltura*; complete with substantial notes relating specifically to agriculture in the Milan area, this version was published for the Austrian government of the Regno Lombardo Veneto, which then had it sent out to all the region's parish priests. Whilst the translation was the work of *cavalier* Carlo Amoretti, secretary of the Milan *Società Patriotica*, work on compiling the notes which adapted the text to the needs of Lombard farmers was begun by friar Cattaneo, vice-secretary of that body; ill-health, however, would mean he had to give up the task, which was then completed by Paolo Lavazzeri. Ten years after

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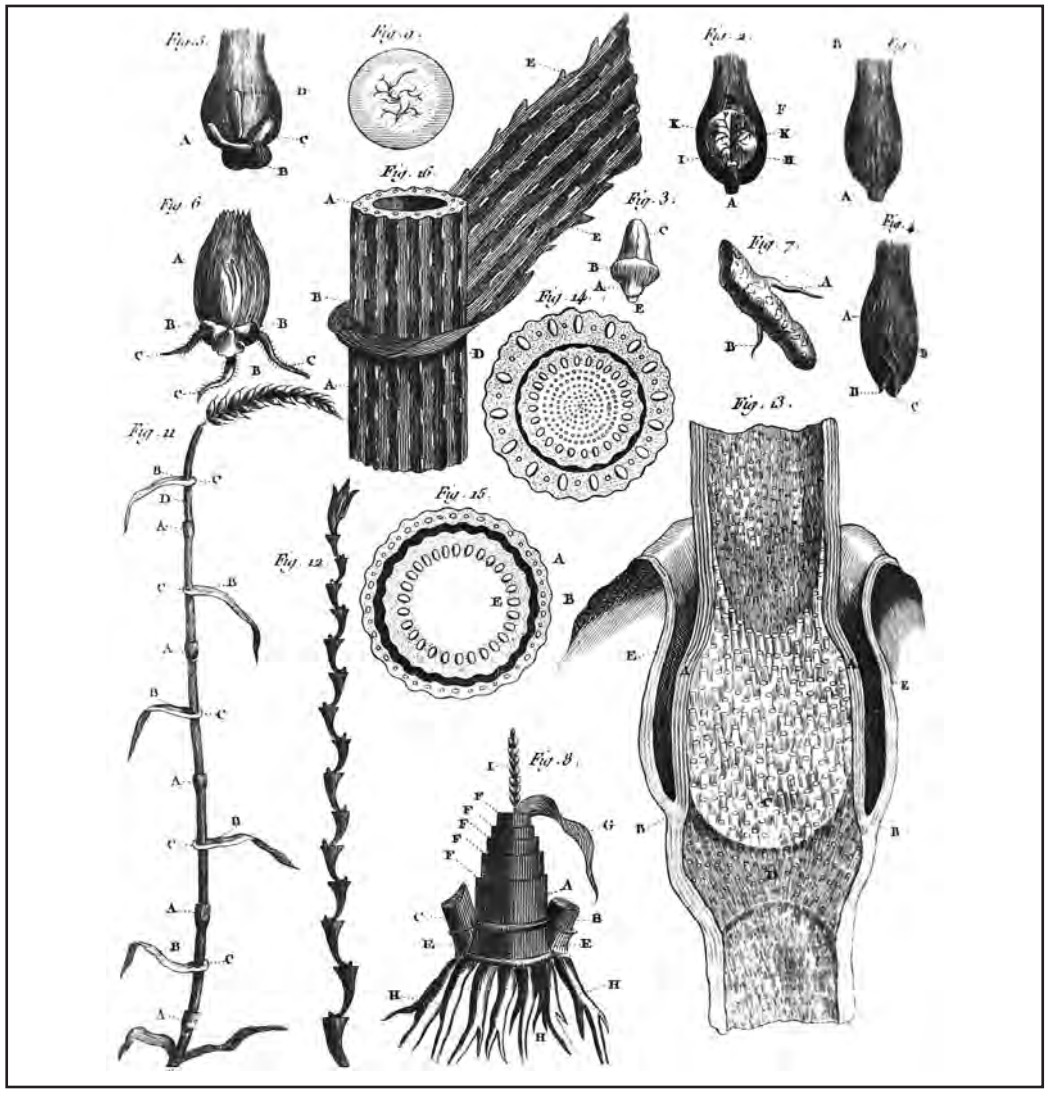

Drawn from the studies of the Abbé Poncelet, a work of extraordinary descriptive precision, this plate accompanying the entry on *Blé* illustrates the development of the wheat plant. Illustrations 1, 2, 4, 5, 6 show the sequence of phases in the swelling of the seed and the emergence of the radicle and hypocotyl as its sprouts; ill. 3 shows the sprout separated from the seed, and ill. 7 a portion of the radicle. Ill. 8 shows the appearance of the plant as it is about to push above the soil in springtime: at the summit of the cut internodes emerges the embryo of the plant ear, accompanied by the vexillum leaf. At the base of the plant are two secondary culms, which the plant put forth during the winter. Ill. 11 shows the plant after the ear has merged from the sheath of the upper leaf; ill. 12 is an image of the rachis of the ear shorn of the spikelets; ill. 13 is a section across the plant at the high of a node, when the culm is full of parenchyma (the sheath of the upper leave originates in the node). Ill 14-15 show a horizontal section of the culm at a node and internode space respectively: the vessels of the xylema and phloem are rendered in great detail. The explanations Rozier gives are rather less precise than the images: the imperfections still existing in Poncelet's analysis of the plant's anatomy go together with his own inaccuracies and simplifications.

common almond tree. The fruit [of these trees] *is barely eight or nine lignes* [1 ligne = 0.225 cm] *in length and seven or eight in width, and it is very hard. The nut of this fruit is less bitter than that of our bitter almonds, and has the same taste as a peach stone. Is this, therefore, the same type as our common almond? In which case, it would not have been worthwhile to bring it to Europe* [sic]. *In France-Comté, Provence and Languedoc, one finds hedges of almond bushes. Their leaves, blossom and fruit are much less striking than those of the common almond tree; but they are much more voluminous than those M. Tournefort describes. The reason is that these hedges […] were grown from the nuts of bitter almonds. In order to identify the origin of the common almond, and to make out if it is a species that has been perfected through cultivation and craft […], one would have to plant over and over and over again the fruit produced by these hedges.»*

In the next part of this entry – dedicated to methods of cultivation – Rozier examines an issue that is typical of discussion of applied plant physiology: the possibility of using grafting to change the almond tree's characteristic early blossoming, thus obtaining a late-blossoming tree that could be grown in more northern climes exposed to late frosts. Whilst certain authors had claimed such a thing could be done, Rozier advances coherent arguments against them (in chapter four of the same entry):

«*If one grafts an almond onto a peach or plum tree, the new graft will vegetate at the same rhythm and with the same early blossoming as ordinary almond trees. […] Each species of tree requires a certain degree of warmth for it to vegetate.* [The heat] *that causes the movement of*

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of great interest because of the light it casts on an activity which at the beginning of the nineteenth century was still the basis of the economy in a vast area of southern Italy – as it had been for centuries. In his first chapter, Onorati writes:

«According to the calculations of the Prince of Migliano, the Tavoliere di Puglia spreads over 16,489 carra [1 carra = 2,4216 m^2] *– that is 32,578 versure* [1 versura = 1.2263 m^2]. *Every year more than a million sheep and goats are driven here from many provinces, but especially from Abruzzi. These animals arrive in the general rest areas located close to the area of Puglia on the 20th September each year, and stay there until the 20 or 25th November, after which they move to the Tavoliere. The large livestock that comes here from Abruzzo alone numbers 6,000– around two thirds of which are cows and one third mares. Before the year 1745 that number was as high as 18,000, as Sig. Patini of Roccaraso informs us; he also tells us that, after that period – when there were high levels of mortality amongst the livestock – the Pugliese themselves began to become owners of flocks, which are kept by shepherds from Abruzzo. Throughout the month of May, both small and large livestock return to the summer pastures; those held in high regard in Abruzzo are the ones in the mountains of Gran Sasso, Majella and Mounts Argatoni, Meta and Matese, with Chiarano and Gurguro. The number of beasts of burdens required to carry all the shepherds' equipment on the outward and return journeys – which last around 20 days, depending on how far away the place is – must undoubtedly look like an Arab caravan. One shepherd is responsible for a flock of 300 or more animals, with two dogs to keep them under control; his annual pay is 24 ducats, plus his daily keep in bread, oil, salt, the meat of still-born lambs and fresh dairy products. There is also his clothing, in leather and skins, and usually a gift of cheese (which itself is worth 25 carlini). For 1,000 sheep one needs a total of 7 people and 6 dogs. With that number of men there are also the buttari* [horsemen], *who are responsible for driving the pack animals; each one of them is responsible for 4 or 5 mules, which transport everything that is required by the shepherds if they are to perform their duties and craft.*

The head Buttaro is responsible for the central camp (the place where the sheep and their shepherds are). His job is check on how the shepherds do their job and make sure that the flocks are well taken care of (especially during lambing). He also distributes the bread and the other supplies the shepherds need, and is responsible for the making of cheese. His annual pay is around 40 ducats in cash, together with bread, etc […] Those who own larger flocks, made up of from 3,000 to 10,000 sheep, also have in their employ one or two stewards. To the glory and credit of the people of Abruzzo one should mention that no shepherds, buttari or stewards from the provinces of that region have ever shown themselves to be guilty of fraud, cheating or bad faith. They love and care for other people's flocks as much as their own; and the animal owners of Puglia live with complete faith in the way those people watch over their livestock.»

It was in Naples that the use of polychrome terracotta to model the figures of Christmas cribs resulted in works of great dramatic effect; the skill shown in modelling individual characters and vivid settings would mean that such works form a genre that is worthy of consideration alongside all other expressions of Italian art from the thirteenth to the eighteenth century. The features of these works in part reflect the conflicts within Naples itself, together with the colour and extravagance that are part of the Christian tradition in Southern Europe: the setting may be magnificent but the single figures are often embodiments of poverty and drudgery, while the scene in Bethlehem is more one of a popular festivity than the devout celebration of the Coming of the Saviour. For centuries the people in this region had been the victims of poverty and oppression, and even the great preachers who stirred their religious passions – for example, St. Alfonso Maria de' Liguori - focussed upon life as a vale of tears (acceptance of those tears was said to offer a gleam of hope in a world where there was no rational justification for optimism). Setting aside the deep social and religious significance of the Neapolitan cribs, such works are also of great interest to those studying developments in humankind's relationship with the land. Blessed with a sharp eye for detail, the artists who worked on these compositions portrayed not only livestock – from quadrupeds to poultry and fish – but also the clothing and equipment of shepherds and farmers. As a result, their creations provide a valuable historic account of the implements and social rituals of a still-primitive rural society.

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Two bottles and a beaker for chemical reagents: part of the laboratory equipment used in the experiments carried out in the 1820s-30s by Cosimo Ridolfi at his castle in Meleto (Valdelsa, Tuscany). As well as having to follow procedures which allowed only the most skilful experimenters to obtain genuine results, early chemists were also constantly exposed to the problems posed by impure reagents, whose poor quality could nullify very time-consuming experiments. As one can see from the label on the first bottle, the Italian scientist used products from a Paris laboratory. The height of the three receptacles is 23.5, 16.5 and 13 cm respectively.

Drawing-Off Wine and Storage in Barrels

Having provided the key to an understanding of the basic phenomenon underlying vinification, Chaptal then transcribes selections from a mass of data regarding changes in fermentation brought about by different weather conditions; however, neither he nor the original compiler of that data (Poitevin) give any clear explanation of the effects these climatic conditions might have upon the wine produced when they apply. The following chapter, entitled *Du tems ed des moyens de décuver* [When and How to Draw Off Wines], develops upon a point that Chaptal had already made in examining fermentation itself: the transfer of wine from vats to barrels is of decisive importance in determining the qualities of the end-product. So that the vintner is fully aware of the implications of each of the variables in this transfer, Chaptal describes the practices and customs to be found in various wine-making regions, listing nine rules that provide clear illustrations of their practical effects and results:

«1. The lower the sugar content of the must, the less time it should remain in the vat. Light wines, which in Burgundy are called vins nouveaux, should not stay in the vat more than 6 to 12 hours.

2. If one intends to retain the acid gas in the wine and to make sparkling wines, then the must should not be kept in the vat for a long time. In these cases, one simply presses the grapes then transfers the must to the barrels after perhaps keeping it in the vat for 24 hours; often, however, one does not keep it in the vat for any time at all.

3. The less colour one wants the end wine to have, the shorter the time the must is to be kept in the vat. This rule is especially important for white wines, one of whose most valued qualities is clarity.

4. The higher the temperature, the shorter the time the must should be kept in the vat; the same is true if there is a large mass of must, etc.

5.The richer the bouquet one intends to obtain, the shorter the time the must should be kept in the vat.

6.The denser the must and the higher its sugar content, the longer the fermentation should be.

7.Fermentation should also be longer when one aims to produce wines for use in distillation, and thus one's main concern is the formation of alcohol.

8.The colder the temperature during the grape harvest, the longer the fermentation should be.

9.The richer the colour one wants in the wine, the longer the fermentation should be.»

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Two landscapes painted by Jakob Phillipp Hackert during his stay in Naples: views of the Cava dei Tirreni and San Leucio, locations of two of the most ancient abbeys in Campania. In both we see a landscape dotted with villas, religious houses and farm buildings – a composition typical of the uplands around the coastal plains of Campania. The terrain here may be difficult, but the climate is much more suitable for crops, and generations of peasant farmers and builders had turned this into some of the most densely-populated countryside in Europe. It was this very population density which meant that very little of the rich produce of the area remained to the peasants themselves: to obtain even the smallest plot of land, they were forced to accept the most severe of contractual arrangements.

The Potato: Its Conquest of Southern Italy

Chapter XX in Quartapelle's second volume is particularly interesting because it is dedicated to the potato, which was practically unknown in Italy: the first attempts to cultivate the crop (in the late sixteenth century) had not been successful enough to encourage its spread, and the lethargic seventeenth century had seen no repetition of those experiments. Quartapelle has no doubt about the crop's advantages and laments the fact that it is not more widespread in Abruzzo and Molise; neither region, he points out, was taking advantage of what he saw as the potato's ability «*to make a great contribution to the support and increase of humankind*».

This ability, he observes, had been ample demonstrated in Ireland, where the spread of the crop «*had greatly increased the number of young children […] because parents could find easy means of nourishing them.*»

These nutritional advantages of the potato were, according to Quartapelle, marvellously combined with the absence of risk, as «*growing within the soil, potatoes are not subject to the grave mishaps brought about by hailstones, frosts and miasmas […]*» Held by more than one of those who championed the crop, this tragic illusion would be shattered – in Ireland itself – by the spread of potato blight, which caused more damage than any miasmas or hailstones might do and resulted in the death of hundreds of thousands of "young children" whose parents had looked to the potato as an easy "means of nourishing them". As we saw when discussing Smith, the very scale of that tragedy was closely linked with the ease with which potatoes had previously provided nourishment: wheat, the Scotsman argued, would never have resulted in the same degree of population growth as that brought about through the introduction of the potato.

Quartapelle is happy to note that the crop was just then beginning to make its appearance in the markets of Naples. This comment identifies the beginning of a culinary tradition that would make the Terra di Lavoro province one of the centres for Italian potato-growing. However, the spread of the crop within southern Italy would depend upon a revolutionary change in how it was grown. The need for this – and the necessary adjustments required – were outlined by another local cleric, Canon Giuseppe

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As part of the decoration of the Villa della Topaia for Cosimo III de'Medici, Bartolommeo Bimbi painted a series of "espaliers" of citrus fruit trees made up for four large canvases. The series forms a catalogue of such fruit – from the most common to the rarest – with 116 different types divided into groups. In the painting showing oranges [*arance*], limes [*lime* and *lumie*] and lemons, the cartouche identifies the fruit as follows: «*Arancio Appiccio, Arancio da fiori domestico, Arancio di Portogllo dolce, Arancio della China, Bizzaria, Arancio Turco, Pera Bergamotta razza d'Arancio, Arancio del fior doppio, Arancio da fiori Appiecie, Arancio del Gigante, Arancio scannellato, Mela Rosa, pomo d'Adamo di paradiso, Lumia, Peretone di Gaeta, Limone rollottino, Limone dolce di Spagna, Limone dolce di Portogallo, Limone dolce di Napoli, Lima falsa, Limoncello di*

that all individuals inherit from their parents) and the phenotype, which results from the interaction between those intrinsic characteristics and the environmental conditions within which a specific individual lives.

Having dismissed unfounded ideas with regard to the mutability of inherited characteristics, Gallesio argues that a "natural" classification of citrus-fruit plants must be based upon observation of the reproductive processes within the family, on study of the reciprocal interaction that one can see in these plants (that is, through phenomena of cross-fertilisation). As we have already seen in discussing the work of Duhamel du Monceau, processes of reproduction had already been indicated as the key consideration in future studies of taxonomy (by Linnaeus, himself responsible for the most monumental and highly-developed of the "artificial" systems for classifying plants). Drawing upon the results of his long years of experiments in cross-breeding citrus fruits, Gallesio would be able to deduce a comprehensive theory for the phylogenetic links between them, and then define the coordinates for his own classification of the different varieties of such fruits grown in Europe.

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The sheaves of peasants and tenant farmers in Sabina and Castelli were threshed using oxen, the various families pooling their livestock so that the work might be carried out more rapidly (in shifts). However, the situation was rather different on the larger estates of the Roman nobility. There, farms were rented to veritable "managers", and herdsmen would thresh the wheat harvested from hundred of staiora of land by using the herds of mares that were a essential feature of the large farms of Latium. In a landscape traversed by the remains of an aqueduct dated from the days of the Caesars, this watercolour – painted in the late decades of the nineteenth century by Enrico Coleman – gives a grandiose account of the operation, revealing the passionate interest that artist had in this world. Special skill was required from the animal-driver as he made the horses move in circles over the untied sheaves spread on the ground, otherwise the horses would quickly have become dizzy. To avoid this happening, the herdsman frequently changed the direction of rotation – a difficult manoeuvre that required great dexterity in

of three-year rotation cycles. And in the last chapter we saw how Malthus drew upon historical source material, employing anthropological, demographical and sociological information to deduce the laws which govern the relation between population numbers and natural resources. (Quite fittingly, this citizen of a nation which drew a large part of its wealth from distant lands made extensive use of the journals and diaries left by those who had explored such territories.)

These early studies of the history of agriculture obviously went along with an interest in the comparative study of previous writings on matters agrarian, the first step in which involved establishing bibliographies of the extant material in different European languages. At the end of the fifteenth century, writings on agriculture were confined to a dozen or so Latin works and an equal number of volumes in the main European languages. However, then had come the agronomical works of the Renaissance and the seventeenth century, foremost amongst which were those that expressed the new agrarian ideas being developed in England. The first attempt to establish a catalogue of all this material came in 1740, when Jean François Séguier published his *Bibliotheca botanica, sive Catalogum auctorum et librorum omnium qui de re botanica […] de re rustica et de horticultura tractant* in The Hague. Within a few decades, this work had been joined by Albrecht von Haller's *Bibliotheca botanica*, published in 1772, and the eight volumes of Georg Rudolph Böhmer's *Bibliotheca scriptorum historiae naturalis oeconomiae […] systematica,* published in Leipzig from 1785 to 1789. As each of these works shows, at a time when the first steps were being taken towards that differentiation between disciplines which is characteristic of modern science, agronomy was still firmly linked with botany.

Gradually, however, one sees a move beyond historical essays envisaged as an integral part of agronomical works, beyond agrarian texts incorporated within botanical treatises. New works appeared that were of clear historical intent, accompanied by specialist bibliographies of writings on crop cultivation. And it is these which can be said to mark a coming-of-age in the historical and bibliographical study of such material. To complete our survey of this period of the agrarian revolution, we must now look at one work that was of historical intent and two that were more bibliographical in focus.

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Wierotter's image of August shows a dense traffic of men and animals along a road by the side of a group of huts. The depiction admirably combines swiftly-sketched lines and a precise attention to detail – for example, the form of the roofs and chimneys, the animal enclosures, the types of carts (one covered, one open). Alongside this precision one sees the same fascination with the grotesque or poverty-stricken aspects of peasant life that had inspired Pieter Brueghel and a number of artists who came after him.

steward or a tenant. The German notes that it was rather rare for this agent to be the former. In fact, in the area that is the focus of his studies – the large aristocratic estates of Braunschweig, Brandenburg and Mecklenburg – there were no figures comparable to the British "gentleman farmer"; the *Junker* realised his social aspirations on the battlefield not in a field of turnips, leaving the latter to the care of a salaried dependant. Such an "agent" or "farm director" had not only to have wide experience but also to enjoy the full trust of a landowner who granted him extensive powers of action. Unless this was the case, he would not be able to run the farm with the sort of military discipline which, Thaer stresses, was necessary if the concern was to function efficiently.

The most delicate aspect of the relations between landowner and farm manager was, in Thaer's view, the issue of improvements and the capital required to implement them: given that such measures depended upon the owner temporarily foregoing a part of the usual profits from his land, there had to be comprehensive and unequivocal agreement between agent and proprietor before they were undertaken. And while the manager should never undertake such changes without explicit approval, it was also the case that they should never leave him out of pocket (in those cases where his salary was decided as a percentage of farm income): if this did happen, the farm manager would obviously have an incentive to avoid such improvements.

With regard to the case where the improvements were the work of a tenant, Thaer stresses that assessment of their value was one of the most difficult issues to decide when drawing up a tenancy agreement. Here, however, he lays down as a principle that the longer the period covered by that agreement, the more the interests of tenant and landowner converged: when the lease was long, the former would be able to enjoy the fruits of his improvements for a good two-thirds of his time as tenant. On the contrary, where the tenant had a short lease, his interests were clearly not the same as the landowner's; in such cases, Thaer observes, even the best legal experts could not draw up a contract that would encourage the short-term tenant to make improvements.

Having deduced that it was only long tenancy agreements that could provide tenants with the incentive to make improvements, Thaer argues that the national

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Abstract

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