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# *Hyphen*

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# TOWARDS AN ECONOMIC HISTORY OF EIGHTEENTH CENTURY MALTA

Buzzaccarini Gonzaga's Correspondence to the Venetian Magistracy of Trade  
1754-1776.

**Victor Mallia-Milanes**

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The restraining late medieval legacy of allegiance and dependency which the Knights of St. John inherited on settling in the tiny central Mediterranean island of Malta had never been compatible with the Order's grand aspirations<sup>1</sup>. The history of Malta's foreign relations from 1530 to 1798 is the story of the Order's conscious and protracted efforts to remove the negative structural and institutional forces which debarred growth and development in order to mobilize the positive forces which would lead to economic progress. It was a difficult task to break away from the pattern of politico-economic subjection — to powers like France and Spain — to conditions which would reduce Malta's complete dependence on traditional markets, manufactures and capital. Veneto-Maltese mutual economic approaches during the eighteenth century were just one outstanding example of this complex process of economic re-orientation. It is my purpose here to examine these "approaches" within the broad framework of the island's economy as a whole and the conceptions of it entertained by the Venetian Magistracy of Trade — the *Cinque Savi alla Mercanzia*<sup>2</sup>. My examination will draw heavily on the large collection of Massimiliano Buzzaccarini Gonzaga's original, manuscript despatches from Malta to the Cinque Savi<sup>3</sup>.

## I BUZZACCARINI GONZAGA

### The Man

On 21st April, 1776 Antonio Pousielgues, the Venetian Consul in Malta<sup>4</sup>, wrote to the Cinque Savi in Venice to tell them of the sad and sudden death of Buzzaccarini Gonzaga<sup>5</sup>. Still a minor<sup>6</sup>, Commendatore Fra Massimiliano Emanuele<sup>7</sup>, Marchese<sup>8</sup> Buzzaccarini Gonzaga<sup>9</sup>, from Padua<sup>10</sup>, son of the noble Antonio de Buzzaccarini, Knight of San Giorgio<sup>11</sup>,

professed a Knight of the Order of St. John of Jerusalem on 20th January, 1712<sup>12</sup>. On 25th September, 1754 he was the first to be accredited *Huomo della Repubblica di Venezia* to the Grandmaster's Court in Malta<sup>13</sup>, and on the morning of 4th December he arrived on the island in that capacity<sup>14</sup>. Soon after, he paid courtesy calls on all members of the Venerable Council<sup>15</sup>.

In his letter, the consul paid tribute to the Knight for his "rare and sterling qualities" he had demonstrated

throughout his long term of office as Venetian Minister in Malta<sup>16</sup>. For an almost<sup>17</sup> uninterrupted stay of over twenty years on the island, Buzzaccarini Gonzaga had been entrusted with protecting and helping all Venetian subjects who either "proceeded to Malta for purposes of trade", or who were "conducted to that place by shipowners and Christian corsairs". In the latter case, he was "to procure, by care and effort, the immediate release of ships, effects and persons", and to take cognizance of "all minute details of the circumstances", particularly, the exact locality in which such "arrests" had occurred<sup>18</sup>.

### His Correspondence

During his tenure of office, Massimiliano Buzzaccarini Gonzaga kept in constant touch with the Venetian Magistracy of Trade, writing an average of one letter a fortnight<sup>19</sup>, giving what may be defined as a regular news-sheet, enriched by frequent, sound value-judgements of all that was happening in and around Malta. The whole collection is an enlightening and vociferous primary source for a socio-economic history of eighteenth century Malta. It owes its importance to four basic reasons. Firstly, it records not only the major events in the history of Malta during the period covered by the letters, but also the daily occurrences which usually pass unnoticed, and therefore unrecorded, in normal official correspondence<sup>20</sup>. Secondly, it penetrates deeply into the nature, character and potentiality of Malta's economy<sup>21</sup>. Thirdly, Veneto-Maltese day-to-day commercial and mercantile relations are presented in a clear and vivid perspective<sup>22</sup>. Finally, it throws sharp

light on the island's trade links with other European, Levantine and North African markets<sup>23</sup>.

Buzzaccarini Gonzaga's correspondence ranges from an analysis of matters of far-reaching influence on Venetian policy in the central Mediterranean<sup>24</sup> to items of purely local significance<sup>25</sup>; from an accurate rendering of the certain repercussions of the "Ottoman Crown" episode on the whole of Christendom<sup>26</sup>, probing with precision into the state of fortifications of the Maltese Islands in the 1760s<sup>27</sup> and into the psychology of the local inhabitants faced with an imminent Turkish assault<sup>28</sup>, to frequent passing references to a long-drawn-out postal dispute between the Government of Malta and Sicily<sup>29</sup>; from a meticulous description of Malta's trade potentialities<sup>30</sup> to the attempt by Robert Damiens on the life of Louis XV<sup>31</sup>; from the feasibility of establishing through Malta permanent trade links between Venice and Denmark<sup>32</sup> to the celebration on the island of the feast of "Our Glorious Protector St. Mark"<sup>33</sup>; from news that Algiers had declared war on the Dutch and Livornese<sup>34</sup> to news of the "immense damages caused by a terrible earthquake" in Lisbon, of floods in Cadice<sup>35</sup>, the wild spread of plague in Algiers and of an epidemic in Naples<sup>36</sup>.

The collection of Buzzaccarini Gonzaga's correspondence, in conjunction with the equally important consular despatches<sup>37</sup>, provides ample documentation for a reconstruction of the gradual evolution of Veneto-Maltese commercial relations during the eighteenth century<sup>38</sup>: from the very poor facilities available to Venetian merchants and seamen in Malta in 1700<sup>39</sup> to the formal establishment in the 1750s of a

Maltese Consulate in Venice and a Venetian Consulate in Malta<sup>40</sup>; from the negligible trade carried out between Venice and Malta in 1700<sup>41</sup> to the lucrative bilateral commercial agreement between the two countries in the 1760s<sup>42</sup>; from the occasional appearance in the Maltese harbours of an insignificant number of Venetian vessels at the opening of the century to the Venetian Republic's full exploitation of Malta as a naval base in the 1780s<sup>43</sup>.

## II AN ECONOMIC SURVEY?

### Buzzaccarini Gonzaga's description of Malta

It took Massimiliano Buzzaccarini Gonzaga seven years to survey Malta's economic condition and potentialities. In 1761 he defined the island as "a country extremely limited in natural resources"<sup>44</sup>, producing only cotton fibres<sup>45</sup> and a very limited amount of ashes<sup>46</sup>. The latter were mostly imported from Sicily<sup>47</sup>, to be in turn resold to a number of foreign markets, including Venice<sup>48</sup>. For almost everything else the island depended on foreign sources of supply<sup>49</sup>. Malta, implied Buzzaccarini Gonzaga, would gain in economic significance to the Venetian emporium if only its purchase-market potentialities were fully exploited. The process would prove feasible and the attempt viable if the island would be encouraged to redirect its search for raw materials to the Adriatic port<sup>50</sup>. The only difficulties were of a partly psychological character. On the one hand the Order had always been ready to grasp at every opportunity to offset its old ties of politico-economic dependence on Sicily, Spain and France, but due to the nature of its composition<sup>51</sup>, it still harboured in

general an innate preference for anything that was French. French commodities enjoyed a privileged position in Malta. The knights in their majority were prejudiced against anything else<sup>52</sup>. This frame of mind on the part of the administration was bound to restrain the conduct of trade and restrict the extent of trading operations. On the other hand the Maltese merchant, accustomed as he was to the traditional slow rhythm of his unadventurous and unsophisticated trade, to the small range of his land's agricultural yield and to his unrivalled, regular sea links with Sicilian ports, was by nature conservative<sup>53</sup>. The process of change would have to be gradual<sup>54</sup>. Only "with industry and confrontation", confessed Buzzaccarini Gonzaga, would he be able to overcome these difficulties<sup>55</sup>.

Not that the Maltese merchant was unresponsive to initiative or ambition, to risk or adventure. His bold piratical incursions in the Adriatic were not an uncommon occurrence, even as early as the fourteenth<sup>56</sup> or fifteenth<sup>57</sup> century, while his daring corsairing activity in the Levant during the next two centuries was as dreadful to the Turks as it was devastating to the Venetians<sup>58</sup>. By the time Buzzaccarini Gonzaga was writing, the Maltese merchant — partly with the connivance of the Order, partly on his own initiative — had previously tapped the Venetian market as a secure source of supply<sup>59</sup>. Large assortments of commodities — from timber, wax and ironmongery to paper, copper, mirrors and other glassware — were shipped from the old Adriatic port to Malta, very often in exchange for ashes of Kalimagnum<sup>60</sup>. This commercial service was of long standing<sup>61</sup>. Other vast shipments of foodstuffs and other products were purchased from Levantine markets, whereas it was

only recently that the Maltese merchant had been venturing on Dalmatian markets, particularly for wine<sup>62</sup>. He had also lately resolved to start buying ironmongery from Trieste, seemingly unaware, according to the Venetian Minister, of "loss of time on the longer voyage and of differences in weights and quality"<sup>63</sup>. The Maltese merchant sailed to these distant ports, in distant hostile waters, rarely safe from piracy or immune from similar mishaps, with "ready cash" on board, entirely at his own risk<sup>64</sup>.

Buzzaccarini Gonzaga's "economic survey" mentioned other determining factors. The first was the Greek merchant whose ties with Malta had for long been close<sup>65</sup>. With the services of a Greek Consulate on the island<sup>66</sup>, he frequently visited the place on his own ship or on foreign galleys as a peaceful trader, received safe-conducts from the Grandmaster, dealt in the 'art' of ransoming slaves and often called at the local tribunals to sue against "wrongful depredations"<sup>67</sup>. A favourite pilot on Maltese vessels, he knew very well the worth of the Maltese corsair in the Levant, occasionally supplying him with important secret intelligence<sup>68</sup>. Sensitive to the urgency and priority the Order attached to the grain trade and to the perennial wheat shortage experienced by the island, the Greek merchant was continually exploiting the situation<sup>69</sup>. He was a formidable trader in the Mediterranean and an even more formidable competitor in Malta's grain and timber trade, always managing to extract handsome profits, and being occasionally mistaken for Venetian<sup>70</sup>.

The Order's social life in its "commodious palaces of Valetta... and the countryside"<sup>71</sup>, at once dignified and impressive, extravagant and

ceremonial, became through the years more sophisticated, and sharpened its members' ever increasing appetite for luxury. Economically this was another effective force of change. On the other hand, the Maltese inhabitants' experience of "prosperity and a comfortable standard of living"<sup>72</sup> was mirrored in the island's steady demographic growth. From 64,000 inhabitants in 1650<sup>73</sup>, population increased to 100,000 a century later<sup>74</sup> and to about 130,000 by 1785<sup>75</sup>. Amelioration in the social life of the country was bound to be reflected in, and in turn to stimulate, the diversification of Malta's trade pattern.

### The Cinque Savi's idea of Malta

The Cinque Savi's idea of Malta in the 1760s was derived partly from Massimiliano Buzzaccarini Gonzaga's correspondence and other regular despatches of the Venetian consul resident on the island<sup>76</sup>, and partly from the rich collection of original documentation preserved in the Archives of the Magistracy<sup>77</sup>. In 1761 they submitted a detailed, elaborate report on Malta to the Venetian Senate<sup>78</sup>. The report, hitherto unpublished, is important to the economic historian of the Mediterranean. In clear and specific terms, the Cinque Savi laid down what they considered to be the basic characteristics of Malta's economic structure and trade pattern and the island's potentialities as a purchase-market and commercial entrepôt. In so doing they penetrated into the nature of the former close Veneto-Maltese trade links and into the forces that were threatening to undermine these ties in the eighteenth century. The report is a forceful attempt to fit in Malta's developing commerce with the Venetian policy of self-readjustment and rehabilitation,

placing the various events and developments in Mediterranean economy in perspective. It betrays a vivid consciousness of the complex forces pressing hard on the Republic's ailing economy. In fact, the Cinque Savi's concept of Malta was conditioned by the Republic's inability to reassert its identity and its withdrawal productively "further and further into uncomplimentary local and parochial economies" <sup>79</sup>.

Nature, the Cinque Savi pointed out, had been deplorably avaricious in her dealings with Malta. The rigidity and barrenness of the soil deprived the country of any natural resources, contributing only towards the island's impregnability <sup>80</sup>. As if to conform with the meagre character of the land, the local inhabitants were renowned for their lack of skill and inexpertise in every important trade <sup>81</sup>. With revenues flowing "luxuriously" into the country from the Order's possessions all over Europe, and with the islanders' practice of exchanging a highly restricted range of local products, the Order of St John was compelled to seek from foreign sources not only "essential foodstuffs" but also "all other commodities for human use and comfort" <sup>82</sup>. The island was bound regularly to import what the Cinque Savi called "the produce of the land" — like wheat, oil, wine and salt — either from neighbouring markets — like those in the Kingdom of Naples, Sicily and the Morea — or from others which, due to surplus production, were deemed of greater convenience.

The Cinque Savi recalled that centuries earlier the political situation in the Mediterranean had deprived the Republic of her previous customers and of her commanding position. Cities, like Marseilles <sup>83</sup>, were quick to take over the role previously

monopolized by Venice. States, "better enlightened" and "provided with their own merchant fleets", like France, Holland and England, by-passed her as the traditional middleman <sup>84</sup>; others "opened their own ports" with a similar objective. "The Court of Vienna" did its utmost to attract these new, commercially "independent" States to Trieste, "deviating their [original] trade routes to our detriment", while "the merchants of Trieste, flying the Imperial flag, diffused themselves in all parts of the commercial world" <sup>85</sup>. Nevertheless, Venice in the 1760s, according to the Cinque Savi, was still "a centre of distribution of copious congeries of manufactured goods" <sup>86</sup>.

Nor was the Adriatic port by any means a new source of supply for Malta. On many previous occasions the *Dominante* had supplied the island's demands for a vast array of manufactured goods of iron, steel, copper and brass <sup>87</sup>. Amid the changing circumstances of the Mediterranean, the Order — and on its example, the Maltese merchant — still favoured its traditional Adriatic market, until it succumbed to such forces as self-interest and pressing warnings from its Resident Receivers in Venice <sup>88</sup> to change its trade direction <sup>89</sup>. "Some under Austrian, some under Roman influence," these Receivers sought respectively to promote the commercial interests of Trieste, Leghorn and Ancona, aiming successfully, according to the Cinque Savi, at redirecting Maltese merchant ships. This deviation of Maltese trade became even more pronounced in 1761 when a number of Maltese ships proceeded to load the whole or part of their merchandise in Trieste <sup>90</sup>. On this occasion the Maltese merchant availed himself of the proximity of other neighbouring markets to buy

supplies of sugar and wax from Fiume<sup>91</sup>, glassware from Bohemia, paper from Romagna, silk goods from Tuscany and many other commodities from surrounding markets<sup>92</sup>. The Venetian consul in Trieste, wrote the Cinque Savi, had repeatedly informed the Magistracy of these developments<sup>93</sup> which were again to be "respectfully stressed" later by Knight Michele Sagramoso<sup>94</sup>, "who, with noble sentiments, [sought] to remedy the loss suffered by Venice on account of Maltese trade deviation by possibly redirecting it in the future"<sup>95</sup>.

To achieve this end, it was vital to find means of restoring confidence to the Maltese merchant community. "It is therefore necessary," concluded the Report of 1761, "to make every effort to recall and reinstate a not unimportant branch of commerce which has slipped visibly from our hands, and in so doing, has undermined not only a portion of our distribution of Germanic goods, but — and this is even worse — a host of our own manufactures."<sup>96</sup> Anxious to secure the possible benefits of a Veneto-Maltese trade link, the Cinque Savi alla Mercanzia deemed it expedient "to relieve that branch of commerce of export duties and, by way of restitution, of import duties too on all Germanic goods exported to Malta. These burdens had lain at the root of Malta's trade deviation."<sup>97</sup>

### Malta's customs-tariff system

Busta 43 of the Archives of the *Gran Priorato dell'Ordine di Malta* in Venice contains a very interesting document on the system of customs-tariff practised in Malta<sup>98</sup>. In principle customs dues were generally reckoned in terms of value, while extra charges were imposed separately on different classes of merchandise, rated in terms of

weight (*cantaro, salma...*), volume (*botte, cafisio, barrile...*) or number (*dozana...*), depending on the type of goods involved. There were two rates of customs-tariff<sup>99</sup>. Merchandise imported by nationals and Sicilians<sup>100</sup> was charged 3½% *ad valorem* duty, while all other foreign merchants were subject to a 6½% *ad valorem* duty. Foodstuffs and potables, together with any other type of merchandise freighted to the Order in Malta by its Receivers in Europe, were exempted from all customs dues<sup>101</sup>. Dues on transit-trade, a facility to be enjoyed only by the foreign merchant, were reckoned at 1% if re-exported within a year; otherwise, the levy for bonded merchandise was worked out at the rate of 6½% for Maltese/Sicilian merchants and 12% for all other foreign traders<sup>102</sup>.

Tables A, B and C are a reproduction of the above-mentioned document. They give a clear and detailed cross-section of the Maltese customs-tariff system and other related charges imposed by the local autonomous corporation known as the *Università dei Giurati* whose main function was to administer the *Massa Frumentaria*, which gave interest of 3% *per annum* on savings deposits. Investments in the *Massa Frumentaria* would go for the purchase of the necessary foodstuffs, particularly wheat<sup>103</sup>. Table D shows consular dues in Malta.

## III AN UNWRITTEN TRADE

### AGREEMENT

#### Buzzaccarini Gonzaga's initial measures

In Buzzaccarini Gonzaga's early correspondence (i. e. from 1754 to 1760), only occasionally does one come across isolated references to ships proceeding to Malta with Venetian



merchandise. But was not this the Venetian consul's task? <sup>104</sup> In May 1755, for example, *La Galleria S. Pietro*, master Nicolò Tarabocchia, arrived in Malta from Venice in 46 days, laden "with effects" for "this Sacred Religion" <sup>105</sup>, while Pietro Iannich "unloaded" in Malta "a cargo of wheat" before proceeding to Trapani <sup>106</sup>. Others came, at remote intervals, with shipments of construction timber and other merchandise <sup>107</sup>. It is however in conjunction with his "economic survey" that Buzzaccarini Gonzaga's initial measures to augment Veneto-Maltese trade relations should be traced. In his letter of 1st June, 1761 the Cinque Savi were told that the local Maltese merchant was seemingly inclined to start buying "quantities of linen operated by Antonio Carrari" from Bovolenta. One Maltese trader was in fact furnished with all relevant information and recommended to a certain Signor Smichia. He was also advised by Massimiliano Buzzaccarini Gonzaga to see for himself "the manufacturing process of silk fabricated in Venice" <sup>108</sup>. Shortly afterwards, the Venetian Minister this time approached the Order on the same question, ordering samples of linen from Carrari. This proposal, wrote Buzzaccarini Gonzaga in February 1762, "was still being considered" <sup>109</sup>. During his "months-long" visit to Malta, Giovanni Martinich was encouraged by the Minister in his attempt to foster a Veneto-Maltese trade link "of no mean consideration [and] from which great benefit would be drawn by Venetian merchants and ships" <sup>110</sup>.

Faced with the triple task of consolidating initial gains, attracting Venetian merchants to Malta and redirecting Maltese trade to the old Adriatic port, Massimiliano Buzzaccarini Gonzaga, in February 1762, proposed the

urgent setting-up of a Venetian Trading House (*Casa di Commercio*) on the island <sup>111</sup>. "It would remedy," he explained, "the inconvenience of a Nation which must avail itself of all opportunities [for its subsistence] to the point of vexing even the foreign merchant whenever it is felt necessary to transact business with him." With a Venetian House in Malta, "merchandise proceeding from the Levant, particularly linen-cloth manufactures, would be stored in [local] warehouses to await the right opportunity, or else transhipped to other markets whenever Maltese merchants were not prepared to pay the right prices." An "established House", affirmed Buzzaccarini Gonzaga, would gradually absorb Malta's eastern Mediterranean trade. This branch of Maltese trade, "which today is being carried out by the Maltese merchant, would be performed by Venetians on their own ships; merchandise would be brought to Malta either through commission or put in bond for a year as foreign merchandise in transit, paying 1% duty besides warehouse dues." If this objective materialized, thought the Minister, "the introduction of other commodities, like wool, silk and other manufactures, would be a matter of course...; besides, these articles would also sell in Sicily and Barbary" in exchange for ashes, Tunisian linen-cloth and a host of other goods. Deeply rooted and sustained commercial contacts existed between Malta and these parts, and trade with the area gave ample scope for development, manouvre and even monopoly <sup>112</sup>. However, the establishment of a Venetian Trading House in Malta, in Buzzaccarini Gonzaga's view, was bound to encounter an important technical difficulty. Would Venetians be granted equal rights to trade on the island as the Maltese merchant?

Would they be subjected only to the same customs-tariff? How would the conservative Maltese merchant react to such a project? Massimiliano Buzzaccarini Gonzaga had to wait for instructions from Venice before starting formal negotiations with the Grandmaster <sup>118</sup>.

### The 'April Decrees'.

In 1761 the Sublime Porte was threatening the island of Malta with an imminent assault unless the *Ottoman Crown*, "the most beautiful vessel of Constantinople", was immediately restored by the Order <sup>114</sup>. Faced with the serious, turbulent situation at Constantinople <sup>115</sup>, and sensitive to the urgent precautions being taken in Malta against any Turkish attack <sup>116</sup>, the Venetian Senate, on the Order's petition, granted Knight Michele Sagramoso licence to export duty-free from Venice large quantities of pick-axes and mattocks to the island <sup>117</sup>. Sagramoso was no idle diplomat. He was fully acquainted with the Republic's inclination towards securing a purchase market in Malta and using the island as a central Mediterranean entrepôt <sup>118</sup>. Early in 1762, in his capacity as Acting-Receiver in Venice <sup>119</sup>, he submitted, on his own initiative, a new case before the Senate. The dynamic element, latent in every society however conservative, would regenerate the island's old trade link with the *Dominante*, if carefully exploited with regards to Malta. With psychological finesse, he explained that it had always been the Order's desire to reactivate Maltese trade with the Adriatic port in preference to any other foreign market <sup>120</sup>. Were not heavy tariffs and high prices among the main causes of deviating Maltese commerce with Venice and her colonial ports? If the tariff exemptions

granted lately in connection with the *Ottoman Crown* episode were extended and made permanent, would not both the Venetian merchant and the Order of St John benefit? Would not this be a wise gesture on the part of the Republic to encourage the Maltese merchant to redirect his trade towards the Adriatic market, and inject Veneto-Maltese trade with a new vitality <sup>121</sup>? The Senate described Sagramoso's case as "worthy of being cultivated and fully seconded" <sup>122</sup>.

In April 1762 the Venetian Senate issued two important decrees. The first, dated 2nd April, exempted *Germanic* merchandise directed to Malta via Venice from all export duties for a five-year probationary period. Import charges imposed on such goods on entering Venice were to be refunded <sup>123</sup>. The second decree, dated 30th April, extended tariff exemption to *all* merchandise exported to Malta <sup>124</sup>.

In the context of the second decree, complete tariff exemption meant reimbursement of all dues (import and export) paid on merchandise shipped to Malta. To qualify for such a privilege, the Maltese merchant had to follow a set of prescriptions stipulated in the *Terminazione degl' Illustrissimi, et Eccellentissimi Signori Cinque Savi alla Mercanzia. Che comprende li Metodi da osservarsi per bonificare il Dazio d'Uscita a tutte le Merci, che saranno estratte per Malta, e quello d'Ingresso ai Generi infrascritti. Approvata con Decreto dell' Eccellentissimo Senato dei 30. Aprile 1762. Stampata per li Figliuoli del qu. Z. Antonio Pinelli, Stampatori Ducali* <sup>125</sup>. In brief, the methods and documents demanded by the Cinque Savi were the following:

#### On arrival in Malta

— ship's master would submit the Bill of

lading to the Venetian consuls, who would verify whether the shipped *colli* were strictly in accordance with the *Bolletta*. He would then issue a *Responsale*, a document, bearing the consular seal, certifying the arrival of merchandise.

#### Before departure from Venice

— two authentic copies, bearing the merchants' signature, of the *Manifesto di Mercanzia*, which contained (a) a detailed description of the nature, quality and quantity of the merchandise about to be exported; (b) the name of the ship being used for the purpose; and (c) the Master's name.

— one copy had to go to the *Fede Raggionato* of the Magistracy of Trade, the other to the *Fedel Nodaro* and *Scrivano d'Uscita* for scrutiny and registration.

— two copies of the Bill of lading (*Bolletta*) identical to the *Manifesto*: one for the owner of the merchandise, the other for the *Raggionato*.

— sorting out and packing of merchandise into *colli* in the *Fante's* presence.

— each *collo* had to be sealed with the "Stamp of Our Protector St Mark".

— Lading of merchandise on board in *Fante's* presence. *Fante* would give Captain an authentic list, bearing his signature, of merchandise laden on ship, to be handed over to the *Raggionato*.

— no alteration could be made in the *Manifesto* after this stage.

— *Responsale* to be countersigned by Massimiliano Buzzaccarini Gonzaga in his capacity as *Uomo della Repubblica*.

#### Claim

— Submission of authentic *Responsale* to *Fedel Raggionato* in Venice for reimbursement of all duties paid in the process.

The Maltese merchant's right to reclaim duties on goods paid on entering Venice was restricted to a host of commodities specified in the *Terminazione*. The list, comprising 47 different types of commodities, is being reproduced here in the original.

#### Nota de' Generi, ai quali sara' restituito il-Dazio d'Ingresso alla loro estrazione per Malta

Bande di ferro  
Bazze di Fillo di ferro  
Caldare e Caldarette di Rame  
Corigioli  
Chiodi di sorte  
Fil di Rame diverso  
Lamerini di Ferro  
Legnami Tedeschi  
Lime di Ferro  
Lime di Paglia  
Oro battudo da Colonia  
Piconi di Ferro  
Rame di Piancia  
Rame rosso diverso  
Telle Carnizze in sorte, dette  
/anco Lubiane  
Telle Cavalline

Telle Costanze curate  
Telle Costanze greze, Olandine  
/fine, & ordinarie dal Can. e  
Cavalline in sorte  
Telle da Tamisi  
Telle da Campidonia  
Telle di Slesia e di Germania  
Telle di Rensi Tedeschi  
Telle Giurini in sorte  
Telle G. H. cioè Telle greze da  
/Pittori di Cento Aquilone,  
Agnelline, e Ariete in sorte  
Telle Fiocchetti, o sian Olmi  
Telle Negresine  
Telle Occhietti  
Telle Paggere e Paggerine  
Telle Poggiane, o sian da Velle

e da Locca  
 Telle Rigate  
 Telle Sangali e Quadretti  
 Telle Stampate  
 Telle Tovagliate di Lino e Stoppa  
 Telle Terlise e Terlisette  
 Telle Terlisoni  
 Zappe e Zapponi di Ferro  
 Carte Bergamine

Azzali  
 Banda Raspata  
 Banda Stagnata  
 Cortelli con Pironi  
 Cortelli Caravani  
 Fili Latton  
 Lametta di Latton bianca e gialla  
 Padelles di Ferro  
 Trementina

Tariff exemption applied also to the export of heavy timber (*tavolame, travame, alborame*), purchase of which had normally to be exacted from the Venetian Guild of Timber Merchants <sup>126</sup>.

The Republic's measures of April 1762 were explicitly directed at attracting a "not unimportant" branch of Maltese trade away from Trieste <sup>127</sup>. Austrian policy, particularly after the Treaty of Passarowitz, had been especially geared to isolate Venice "within the Adriatic". Austrian Trieste and Rijeka (Fiume) had been declared free ports in 1719 and since then had been waging "an economic siege", "a war of industry" against the Republic. Not only was the fiscal policy at the *mercato realtino* appearing by comparison over-burdensome to the foreign trader — whether from the Levant, the West, Albania, the Turkish provinces or Germany — but was even repellent to the Venetian merchant himself. Total or partial tariff exemptions at the port of Trieste, declared the Cinque Savi, "had lately succeeded in deviating Maltese ships from lading in Venice supplies of Germanic manufactures", previously monopolised by the Republic <sup>128</sup>. These, having been one time the leading articles of Maltese trade with the Republic, used to serve as an occasion for the purchase of a host of other Venetian products <sup>129</sup>. Germanic goods had become much more expensive to buy in Venice than in any other market <sup>130</sup>. In the

face of such growing competition, the April Decrees would lure the Maltese merchant and re-route a substantial part of his trade towards the Venetian emporium.

To stretch the objectives of these concessions a step further, the Cinque Savi commissioned Buzzaccarini Gonzaga to try and follow up the April Decrees by reaching a similar agreement — "by way of treaty" — with the Government of Malta: Venetian merchandise shipped to Malta by Venetian merchants on Venetian ships would receive similar facilities and tariff exemptions at the port of Malta <sup>131</sup>, "until this mutual practice evolved into a permanent convention" <sup>132</sup>.

This was a delicate question which would involve one of the Order of St John's most fundamental principles — that of neutrality. As this subject has been treated at some length in another paper <sup>133</sup>, I shall limit myself to two observations. Firstly, the Grandmaster would not venture on a policy that would prove unwelcome not only to himself but also to his successors, "since the revenue accrued from customs and excise duties constituted a fair portion of his income" <sup>134</sup>. According to an independent source, the Grandmaster's yearly income (*Ricetta Megistrale*) during the early decades of the eighteenth century had risen to about 100,000 Scudi "because customs duties have been extremely increased, higher than ever before".

The same source points out that 30% of the magisterial revenues, then, came from the *Dogana* alone<sup>135</sup>. By the 1760s trade and duties had increased accordingly<sup>136</sup>. Secondly, favouring the Venetian merchant would almost inevitably create a precedent. Exemption of a few would lead to exemption of all. France, Spain, Portugal and the Kingdom of the Two Sicilies would have reason to demand similar tariff concessions which would be diplomatically impossible to refuse. Privileges enjoyed by the Order and the Maltese merchant in French, Spanish, Portuguese, Neapolitan and Sicilian ports were, according to Grandmaster Pinto, much more substantial and extensive than those recently accorded by Venice. None of these had ever approached the Order for anything like preferential treatment<sup>137</sup>.

### An Alternative Design

In August 1763 Massimiliano Buzzaccarni Gonzaga submitted his alternative project to the Grandmaster for the establishment in Malta of a Venetian Trading House<sup>138</sup>. The design was based on three principles.

- 1 One or two Venetian merchant "families" would be granted naturalization, i. e., they would be allowed to take up residence in Malta in their capacity as traders<sup>139</sup> and to enjoy "il Privilegio Nazionale", i. e., all those customs-tariff exemptions normally reserved only for the Maltese merchant.
- 2 They would enjoy "il Privilegio di Transito" or "il Privilegio dei Forastieri", i. e., transit trade concessions not shared by nationals. Imported merchandise, Venetian or otherwise, would be allowed re-exportation from Malta, subject only to 1% duty, and storage in local warehouses for a period not specified period, and used instead exceeding one year; if not exported before the expiry of that for local consumption, it would become subject to the "Law of Higher Duty of 6½%".
- 3 Merchandise initially manifested for transit purposes and afterwards declared for local usage, would be bracketed within the 3½% concession.

Massimiliano Buzzaccarni Gonzaga's design fitted in nicely with the Republic's economic rehabilitation policy. Venetian trade in the central Mediterranean would gradually absorb not only a large portion of Maltese trade but also — due to the island's geographical position — of trade with Sicily and North Africa. The Venetian Minister was, no doubt, conscious of the difficulties involved in apportioning without distinction the comparatively limited trade of the island among nationals and foreigners, as this in practice would necessarily reduce the profits of the Maltese merchant<sup>140</sup>. Nonetheless, the Grandmaster seemed inclined, in general principle, towards acceding to this alternative design, provided that "this acquiescence" would not be embodied in any "authentic document", as this would open the door for other States to make similar claims<sup>141</sup>. The one or two Venetian families would be granted the *privilegio nazionale* and the *privilegio di transito*<sup>142</sup>. The third article was rejected as the principle it involved would automatically render all tariff legislation in Malta extremely flexible to the sole discretion of the owners of the respective merchandise. The Venetian families concerned would be in a position "to assume

control over the largest part of the island's traffic" <sup>143</sup>. The Grandmaster's Decree, granting the Venetian families naturalization and enabling them to partake of the said privileges, would be issued to the merchants concerned, on their arrival and at their own request. This would give the document a *private* character and the Trading House an *informality* of a private business concern <sup>144</sup>.

Although these concessions were not as liberal as their Venetian counterparts, they were nonetheless "acceptable" to the Cinque Savi alla Mercanzia, as they would give the Venetian merchant a greater opportunity of strengthening his trade links with Sicily and North Africa. The only setback was that the agreement would not be embodied in a formally written, binding and officially rectified convention. Successive Grandmasters could, if they so desired, completely disregard it <sup>145</sup>.

Towards the end of their report, the Cinque Savi paid tribute to Buzzaccarini Gonzaga and Sagramoso: the former, for having, with "dexterity" and "true diligence", succeeded in extracting "advantages, singularly concerning Our Commerce" from "a Government indisposed to concede them"; the latter, for his "praiseworthy thoughts and ability" with which he had grasped the opportunity "of redirecting to the *Dominante* the Commerce of Malta" and for "the uninterrupted attention with which he had so indefatigably worked to recall Maltese ships to Our Harbour" <sup>146</sup>.

### Requests for Renewal

Just as the five-year period of Venetian tariff concessions was about to expire <sup>147</sup>, a group of interested, shrewd Maltese merchants — including the brothers Carlo and Antonio

Mattei, Giuseppe Grech, Pietro Felice, Giuseppe Bonello, Giulio d'Andrea, Carlo Ciantar, Gio. Andrea Xerri and Lorenzo Grech — <sup>148</sup> petitioned the Grandmaster "to interpose his good offices" so that the Venetian Republic "would have the kindness to grant the renewal of the said exemptions for another five years" <sup>149</sup>. In 1769, two years after, Massimiliano Buzzaccarini Gonzaga, on behalf of the Grandmaster, submitted a formal request for renewal to the Venetian Magistracy of Trade <sup>150</sup>, asking for a modification of the April Decrees. No reference was made in the application to goods of Germanic origin, nor to Venetian manufactures, which had featured so prominently on the first occasion. Perhaps the most significant trade concession contained in the April Decrees had been the granting of the right to purchase and export different types of timber free of all imposts. The Magistracy was now being asked to retain concession on this indispensable commodity. Buzzaccarini Gonzaga indicated also the Order's desire to start buying regularly annual amounts of grain — from 20 to 30 thousand *staia*, tax-free <sup>151</sup>.

The application was referred to the *Magistrato alle Biave*, but due to a number of difficulties concerning navigation, the State's finances and "domestic economy", it remained shelved for the next twelve years or so <sup>152</sup>. On 20th December, 1781 the question was brought up again by the Order's Receiver in Venice in a *promemoria* submitted to the Venetian College <sup>153</sup>. On the strength of past performances, would a renewal of tax-exemptions prove economically rewarding to the old Adriatic port? Was the preferential treatment which Venice extended to the Maltese merchant in 1762 instrumental to the improvement in the Republic's net-

work of trade relations with other cities? Were there any marked differences in Venetian exports to Malta between the five-year period of concession (1762-67) and later years?

The 1760s had shown promising signs of recovery in Venetian trade relations with Denmark and the Barbary Regencies. Denmark, in her "modernization" drive, was seeking opportunities for expanding her overseas commerce with the east and the Mediterranean. Trade agreements had already been concluded with France, Spain, Genoa and Naples<sup>154</sup>. "Why not with Venice, too?" thought Buzzaccarini Gonzaga. In his despatch of 10th August, 1761 the Venetian Minister submitted an account of his negotiations with the superintendent of a Danish trade mission during the latter's sojourn in Malta. He explained plans for a provisional Veneto-Danish trade agreement and advised the Magistracy to act promptly in that direction lest the outcome might prove as abortive as the 1750 attempt<sup>155</sup>.

In 1763 Venice concluded peace treaties with Algiers<sup>156</sup> and Tunis<sup>157</sup>, in 1764 with Tripoli<sup>158</sup> and in 1765 with Morocco<sup>159</sup>. It is premature, if not too presumptuous, to assert that such a development in Mediterranean history had been a definite outcome of a close Veneto-Maltese *rapport*. Other forces at play there certainly were, particularly Austria's stipulation of commercial treaties with the Barbary Regencies, which Cessi calls "a moral threat to the Republic"<sup>160</sup>. However, Malta's share in the process cannot be denied, if only as a secure and direct source of intelligence, even though her relations with Barbary could have never been cordial<sup>161</sup>. From the Venetian point of view, Austria's progressive relations with the Regencies constituted a very

undesirable stage in Mediterranean political and commercial development. In December 1755 Buzzaccarini Gonzaga informed the Cinque Savi that Turkey had given Algiers specific instructions to settle peace with Austria<sup>162</sup>. Two months later he observed that no marked progress had yet been made towards Algerian peace with the Habsburgs<sup>163</sup>. Was it perhaps because Algiers was at war with Tunis?<sup>164</sup> Was it because Algerian Beys were by nature "always the most insolent and the most fiercely given to the *corso*"<sup>165</sup> Or was it perhaps because the Regency's alliance with the strong naval powers in the Mediterranean, France and England, encouraged Algerian corsairs to confine their reprisals to the weaker nations?<sup>166</sup> Certainly the situation was even worse than in early 1755 when strained relations between the Regency and the Dutch and Livornese had caused unrest to Austrian navigation<sup>167</sup>. Now, even the Austrian consul in Tunis had been conducted to slavery in Algiers<sup>168</sup>. Buzzaccarini Gonzaga depicted the Algerian siege of Tunis with great mastery and detail, overconfident that the Magistracy in Venice would be awaiting news of the latest developments<sup>169</sup>.

Relations between Venice and Tripoli were traced with no less skill and colour<sup>170</sup>. It was precisely in one of his despatches on this theme that Buzzaccarini Gonzaga implicitly confirmed the intermediary role Malta was playing between the Republic and the Regencies. Writing in mid-1764 he referred to the recently concluded peace treaty between Venice and Tripoli<sup>171</sup>.

I trust that this new Commerce with Barbary will provide me with greater opportunities to render service and obedience to Your Excellencies. This Island's position,

being within easy reach, gives me access to the most reliable and speedy information about other Nations' trade with Barbary. Through these Nations, which call here frequently, Venetian consuls [there] would keep me in touch with all developments the moment they receive instructions from Your Excellencies.

Malta had a new role awaiting her. Five months before the Order's Receiver had submitted his *pro-memoria* <sup>172</sup>, a plague-stricken Venetian ketch, the *Buona Unione*, master Girolamo Padella, anchored in the vicinity of Marsamxetto Harbour. With a rich cargo of linen, wool, camel-hide and rice, she had been chartered for Sfax by some Tunisian merchants. "To prevent the plague from spreading and preserve the tranquility of the Mediterranean", the Grandmaster ordered the ketch to be incinerated on the 9th July in St Julian's Creek. The incident was communicated to the Trade Magistracy by Antonio Poussielgues, the Venetian consul in Malta, on 14th July, 1781 <sup>173</sup>. The Venetian Republic's refusal to compensate the loss of 14,000 *zecchini* claimed by the Tunisian merchants <sup>174</sup>, and its failure to overawe the Tunisian Bey with Andrea Querini's imposing squadron <sup>175</sup>, were sufficient evidence that the episode would lead to serious repercussions. It would be suicidal for the Republic to break the good relations with the Order at a moment when Malta was bound to have an important function to perform <sup>176</sup>.

There were other equally important factors to consider. The *Manifesti di Esportazioni e Ruoli di Bastimenti*, contained in the archives of the Cinque Savi, provide a means for an examination of the commodities which filled the holds of most ships trading between Venice and Malta. The correspondence of merchants and consuls

in Malta very rarely recorded the respective amounts, values or volumes of freighted goods; and it is only from 1778 onwards that Antonio Poussielgues started to submit regularly lists, backdated from 1773, of Venetian ships arriving in Malta <sup>177</sup>. Between 1762 and 1767 about 100,000 planks of *Larese* <sup>178</sup> timber was shipped to Malta from Venice <sup>179</sup>. In 1763-64, which were years of severe bad harvests and grain shortage reaching famine proportions <sup>180</sup>, Malta imported over 15,500 *staia* of grain. Other Venetian merchandise included all types of paper (*carta, carta strazza, carta da scrivere, carta da scrivere fina, carta stampata, carta da navigar, cartone*), books <sup>181</sup>, glass panes, mirrors, crystals, nails, copper, lead, wax, turpentine, linen and wool <sup>182</sup>. The Cinque Savi claimed that a close examination of Venetian exports to Malta during the tax-free period 1762-67, when compared to the next five years when tariff concessions had expired, revealed "only a very slight difference". This was a strong indication, they explained, of the vital necessity for Malta to secure regular supplies — with or without concessions <sup>183</sup>.

Besides, in 1782 the *Cinque Savi alla Mercanzia* was still seeking to utilise Venetian trade links with Malta towards a new industrial joint venture. On the 27th September of that year, the Magistracy made overtures to the Venetian consul in Malta for the possibility of having the Order's ships constructed in the Venetian arsenal <sup>184</sup>. Did not the Grandmaster recently attempt to revive the recrudescing Maltese *corso* <sup>185</sup>?

The Magistracy of Trade was in favour of renewing the April Decrees. There was no other country better suited than Malta, they explained, which, in proportion to its slender



means, could readily meet the requirements concerning the promotion of "an active and profitable trade"<sup>186</sup>. However, in view of what were termed as "recent developments"<sup>187</sup>, there were other points that had to be considered before exemptions were renewed. Firstly, a variety of Venetian manufactures "in imitation" of those bought from Germany, particularly *PELLI*, *tele* and *LANA*<sup>188</sup>, could be gradually introduced on the Maltese market in order to stimulate the local industry and to reduce the burden of tax-exemptions<sup>189</sup>. Secondly, regulatory efforts should be made to avoid disparity in prices for the same Venetian commodity. If Venetian timber were undersold from Malta, by way of transit, to Mediterranean and Barbary markets, where it was always in unvarying demand, the credibility of the Venetian product would be subtly undermined and would thus be defeating the purpose of such concessions<sup>190</sup>. In the end, the Cinque Savi proposed a tax-exemption period of

ten years<sup>191</sup>.

Such was the framework within which Veneto-Maltese economic approaches moved during Massimiliano Buzzaccarini Gonzaga's ministry, leading the Order of St John and the Adriatic Republic towards a very close relationship. It was a rewarding process of readjustment for both countries. Venice gained, alongside the other European Powers, a stable position in the neutral, strategically invaluable Maltese principality. The Order of St John found in the Venetian emporium a guaranteed market which it was determined to safeguard at all costs. Pinto's hesitancy to join the papal coalition against the immediate repercussions of the Veneto-Tripolitan Peace Treaty of 1764<sup>192</sup>, and the stringent precautions taken by De Rohan in the 1790s to prevent the recurrence of corsairing hostility in the Levant<sup>193</sup> betrayed an obvious timidity of encroaching upon the Republic's delicate cordiality with Turkey.

#### REFERENCES AND NOTES

AGPV	=	Archivio del Gran Priorato dell'Ordine di Malta, Venice
AIM	=	Archives of the Inquisition, Malta
AOM	=	Archives of the Order of Malta, National Library, Malta
ASV	=	Archivio di Stato, Venice
CSAM	=	Cinque Savi alla Mercanzia
MBG	=	Cinque Savi alla Mercanzia, prima serie, busta 601, Lettere del Commendatore di Malta Massimiliano Buzzaccarini Gonzaga
MCCV	=	Museo Civico Correr, Venice
MV	=	Modo Veneziano
NLM	=	National Library, Malta

1. For a sound bibliography of twentieth century works on the history of the Order of St. John in Rhodes, see J. Mizzi, "A Bibliography of the Order of St John of Jerusalem (1925-1969)", *The Order of St John in Malta with an exhibition of paintings by Mattia Preti Painter and Knight*, Malta 1970, nos. 160-202. Prof. Lionel Butler's long awaited study on the subject is still a *desideratum*. No systematic analysis of the Order's eight-year odyssey (1522-1530) from Rhodes to Malta has yet surpassed R. Valentini, "I Cavalieri di S. Giovanni da Rodi a Malta,

- Trattative diplomatiche”, *Archivum Melitense* IX (1935), pp.137-237.
- For the history of Malta before 1530 the standard work is A. Luttrell (ed.) *Medieval Malta: Studies on Malta before the Knights*, London 1975. It is regretted, however, that the economic aspect has only received passing references. The editor’s contribution, “Approaches to Medieval Malta”, is by far the best modern bibliographical study of the period both in exposition and interpretation.
- The original Bull ceding Malta to the Order of St. John, dated 23 March, 1530, is in AOM 70.
2. M. Borgherini-Scarabellin, “Il Magistrato dei Cinque Savi alla Mercanzia dalla istituzione alla caduta della Repubblica”, *Miscellanea di Storia Veneto-Tridentina* II (Venice, 1926), pp. 1-148, is a useful and readable survey of the history of the Magistracy.
  3. ASV, CSAM, *prima serie*, busta 601, “Lettere del Commendatore di Malta Massimiliano Buzzaccarini Gonzaga”.
  4. He was appointed consul on 22nd March, 1766. AOM 569, f.194v.
  5. ASV, CSAM, *prima serie*, busta 711, 21st April, 1776.
  6. AGPV, busta 166, n. 26.
  7. AOM, f.690
  8. AGPV, busta 166, n. 26, *passim*.
  9. All his letters to Venice were signed “Massimiliano Buzzaccarini Gonzaga”, though the “Gonzaga” was rarely appended to his name in the correspondence he received from Venice or in other Venetian documents.
  10. AOM 2166, pp. 284-285.
  11. See Appendix.
  12. AOM 2166, pp. 284-285. AGPV, busta 166, n.26.
  13. ASV, CSAM, *Diversorum*, busta 403, fasc. 76.
  14. AOM 2231, p.6. ASV, MBG, 7th December, 1754.
  15. *Ibid.*
  16. On at least three occasions Massimiliano Buzzaccarini Gonzaga referred to his being grievously afflicted with gout. *Ibid.*, 12th March, 1763; 23rd June, 1766; 3rd August, 1767.
  17. He had left Malta for Venice on 20th May, 1760 and returned on 3rd April, 1761. For information about his journey, see *ibid.*, 14th June, 1760 (from Padua); 7th March, 1761 (from Rome); 17th March, 1761 (from Naples). During his absence from Malta, his cousin Fra Alviero Zazzo acted as Venetian Minister in his stead. *Ibid.*, 14th June, 1760.
  18. ASV, CSAM, *Diversorum*, busta 403, fasc. 76, “Commissione per l’Huomo della Repubblica di Venezia in Malta”, 25th September, 1754.
  19. See note 29 below.
  20. ASV, MBG, *passim*.
  21. See below.
  22. See below.
  23. The few studies that exist on the commercial history of Malta during the Order’s rule deal only with the island’s trade relations with individual countries. For Venice see V. Mallia-Milanes, “Some Aspects of Veneto-Maltese Trade Relations in the XVIIIth Century”, *Studi Veneziani* XVI (1974), pp.503-553; and the same author’s “Malta and Venice in the Eighteenth Century: A Study in Consular Relations”, *Studi Veneziani* XVII-XVIII (1975-76), pp.265-320. For France see M. Chaillan, “Le commerce de Malte avec Marseille et la France”, *Memoires de l’Insti-*

- tut historique de Provence* (1935), pp.173-199; and J. Godechot, "La France et Malte au XVIIIe", *Revue historique* CCVI (July-September, 1951), pp.67-79. On Anglo-Maltese commercial relations see A.P. Vella, "A Sixteenth Century Elizabethan Merchant in Malta", *Melita Historica* V, 3 (1970), pp.197-238; and V. Mallia-Milanes, "English Merchants' Initial Contacts with Malta: A Reconsideration", *Melita Historica* VI, 4 (1975), pp.342-361. Tunisian trade links with Malta are dealt with by L. Valensi, "Les relations commerciales entre la Régence de Tunis et Malte au XVIIIeme Siecle", *Cahiers de Tunisie* 11 (1963), pp.71-83.
24. See ASV, MBG, 14th April, 19th May, 11th and 25th August, 1st December, 1755; 5th January, 16th February, 1755 MV; 10th and 31st May, 14th, 18th and 26th June, 23rd and 31st July, 2nd December, 1756; 30th January, 1756 MV; 15th March, 1757; 7th April, 1761; 11th January, 1762 MV; 20th May, 19th August, 1763; 7th June, 27th July, 30th August, 1764.
  25. See, for example, *ibid.*, 6th October, 1755.
  26. The author is preparing a paper on the subject.
  27. See previous note.
  28. See note 26 above.
  29. See, for example, ASV, MBG, 10th May, 1756 and 12th August, 1765.
  30. See below.
  31. ASV, MBG, 15th March, 1757.
  32. See below.
  33. ASV, MBG, 22nd March, 19th May, 1756.
  34. *Ibid.*, 14th April, 1755.
  35. *Ibid.*, 5th January, 1755 MV.
  36. *Ibid.*, 10th May, 1756; 27th July, 1764.
  37. ASV, CSAM, *prima serie*, busta 711.
  38. See V. Mallia-Milanes, "Some Aspects...", *loc.cit.*
  39. V. Mallia-Milanes, "Malta and Venice...", p.302.
  40. *Ibid.*
  41. See note 39 above.
  42. See below.
  43. See V. Mallia-Milanes, "The Buona Unione: An Episode in Veneto-Maltese Relations in the late XVIIIth Century", *Journal of the Faculty of Arts*, The Royal University of Malta, IV, 4 (1971), pp.309-326.
  44. ASV, MBG, 1st June, 1761.
  45. As late as 1785 an anonymous traveller to Malta had this to say about cotton production on the island: "Il Cotone è il maggiore prodotto dell'Isola; sorte quali tutto vergine o filato, e le sole manifatture di questa merce si fanno al Gozzo, e consistono in Berette e coperte e calzette. Il celebre M.r de Soufrin (*sic*) aveva fatto negli anni scorsi trasportare a quest'isola una Colonia di 30 indiani; per stabilirvi di que' fini lavori; ma poi da lui stesso fu mandata nelle vicinanze di Parigi, e ne fece un presente al Re." MCCV, *Miscellanea Correr* LXXIX/2654 (unpaginated).
  46. ASV, MBG, 1st June, 1761. V. Mallia-Milanes, "Some Aspects...", p.50+. See also *Istruzione per Ordine de' Censori sopra l'Arte Vetraria per la coltivazione del Kalì Maggior ec.*, Venice 1780.
  47. ASV, MBG, 1st June 1761.
  48. L. De Boisgelin, *Ancient and Modern Malta* I, London 1804-1805, p.109.
  49. V. Mallia-Milanes, "English Merchants...", p.344.

50. ASV, MBG, 1st June, 1761.
51. See J. Godechot, *Histoire de Malte*, Paris 1952. *Id.*, "La France et Malte...", *loc. cit.*; and M. Chaillan, *op.cit.*
52. ASV, MBG, 24th February, 1761 MV.
53. *Ibid.*
54. *Ibid.*
55. *Ibid.*
56. These adventures may be followed in A. Luttrell, "Malta and Dubrovnik towards the year 1380", *Melita Historica* V, 2 (1969), pp.158-164.
57. See F. B[orlandi], "Corsari maltesi a Ragusa nel Quattro e nel Cinquecento", *Archivio Storico di Malta* VII (1936), pp.243-245.
58. A few excellent studies have been devoted to this theme. P. Earle, *Corsairs of Malta and Barbary*, London 1970; A. Tenenti, *Piracy and the Decline of Venice*, London 1967; P. Cassar, "The Maltese Corsairs and the Order of St. John of Jerusalem", *The Catholic Historical Review* XLVI (1960), (1960), 2, pp.137-156; J. Godechot, "La course maltaise le long des côtes barbaresques à la fin du XVIIIe siècle", *Revue Africaine* XCVI, 430-431 (1952), pp.105-113; and R. Cavaliero, "The Decline of the Maltese Corso in the Eighteenth Century", *Melita Historica* II (1959), pp.224-238.
59. ASV, MBG, 24th February, 1761 MV.
60. *Ibid.*
61. *Ibid.*
62. *Ibid.*
63. *Ibid.*
64. *Ibid.*
65. As the Greek merchant's role in Malta's trade pattern has not yet been submitted to any comprehensive analysis, our knowledge of the subject is still imperfect. The same may be said of Malta's commercial relations with the Levant.
66. See, for example, AOM 461, f.316v; *ibid.*, 481, ff. 281v-282v; *ibid.*, 1197, ff.311-314.
67. P. Earle, *op.cit.*, *passim*.
68. *Ibid.*
69. ASV, MBG, 24th February, 1761 MV.
70. *Ibid.* See also *ibid.*, 10th June, 1765; 6th January, 1765 MV.
71. L. Butler, "The Order of St. John in Malta: An Historical Sketch", *The Order of St. John in Malta with an exhibition.....*, p.41.
72. *Ibid.*
73. NLM, *Library* 23, ff.237v-261.
74. H. Bowen-Jones, J. C. Dewdney, W.B. Fisher, *Malta: Background for Development*, Durham 1960, pp. 133-135.
75. MCCV, *Miscellanea Correr* LXXIX/2664 (unpaginated).
76. For a detailed study of Veneto-Maltese consular relations see V. Mallia-Milanes, "Malta and Venice.....", *loc.cit.*
77. See A. Da Mosto, *L'Archivio di Stato di Venezia*, Rome 1397-40.
78. ASV, CSAM, *Diversorum*, busta 396, fasc. 126, *scrittura* 9, 2nd March, 1761.
79. See B. Pullan (ed.), *Crisis and Change in the Venetian Economy in the 16th and 17th Centuries*, London 1968. *Aspetti e Cause della Decadenza Economica Veneziana nel Secolo XVII*, Venice-Rome 1961.
80. The author is preparing a critical edition of an early eighteenth century description of Malta.

81. See previous note.
82. ASV, CSAM, *Diversorum*, busta 396, fasc. 126, scrittura 9, 2nd March, 1761.
83. See J. Billoud, *Histoire du commerce de Marseille: de 1515 à 1599*, Paris 1951.
84. ASV, CSAM, *Diversorum*, busta 396, fasc. 126, scrittura 9, 2nd March, 1761.
85. *Ibid.*
86. *Ibid.*
87. *Ibid.*
88. On the office and function of the Order's Receiver, see AOM 1683.
89. ASV, CSAM, *Diversorum*, busta 396, fasc. 126, scrittura 9, 2nd March, 1761.
90. *Ibid.* See also ASV, CSAM, busta 752, 18th, 25th April, 26th September, 1761.
91. On the Maltese consul in Fiume, see G. Kobler, *Memorie per la Storia della liburnica città di Fiume II*, Fiume 1896, p.78.
92. ASV, CSAM, *Diversorum*, busta 396, fasc. 126, scrittura 9, 2nd March, 1761.
93. See ASV, CSAM, busta 752, *passim*.
94. See AOM 1518, "Memoria" of 31st October, 1762.
95. ASV, CSAM, *Diversorum*, busta 396, fasc. 126, scrittura 9, 2nd March, 1761.
96. *Ibid.*
97. *Ibid.*
98. Enclosed in "[Copia dei] Capitoli che si propongono per esser confirmati da S.A.Em.a con suo Decreto presentati dal Si.gre Cav.re Buzzaccarini".
99. ASV. MBG, 24th February, 1761 MV and 17th September, 1763.
100. In Malta the Sicilians were considered as co-nationals. So were the Maltese in Sicily. See A. Mifsud, "L'approvigionamento e l'Università di Malta nelle passate Dominazioni", *Archivum Melitense III* (1918), pp. 163-212.
101. ASV, MBG, 24th February, 1761 MV.
102. *Ibid.*
103. See, in particular, AIM, *Un Giornale Istorico*, f.12.
104. See ASV, CSAM, *prima serie*, busta 711, especially Poussielgues's despatches from 1778 onwards.
105. ASV, MBG, 19th May, 1755.
106. *Ibid.* See also 2nd June, 1755.
107. *Ibid.*, 31st May, 14th June, 23rd July, 1756.
108. *Ibid.*, 1st June, 1761.
109. *Ibid.*, 24th February, 1761 MV.
110. *Ibid.*
111. *Ibid.*
112. *Ibid.*
113. *Ibid.*
114. See note 26 above.
115. *Ibid.*
116. *Ibid.*
117. AOM 1517, Pinto to Sagramoso, 10th August, 1761.
118. ASV, CSAM, *Diversorum*, busta 396, fasc. 126, scrittura 9, 2nd March, 1761.
119. The Receiver, Fra Zenobio de Ricci, was on a mission in Vienna. *Ibid.*
120. AOM 1518, "Memoria", 31st October, 1762.
121. ASV, *Senato, Deliberazioni, Roma Ordinaria, Secreta, reg.* 108, f.190r.
122. *Ibid.*
123. *Ibid.*
124. *Ibid.*, f.193v. See also ASV, CSAM, *prima serie*, busta 937, Al Buzzaccarini, 30th

April, 1762.

125. ASV, CSAM, *Diversorum*, busta 396, fasc. 126, "Malta".
126. "Altro Metodo per la Restituzione del Dazio a tutti li Legnami, che verranno estratti per Malta, qual dovrà farsi dal Consorzio dei Mercanti da Legname", *ibid.*, "Terminazione.....".
127. ASV, CSAM, busta 190, *Scritture* 1762-63, f.15v.
128. *Ibid.*
129. *Ibid.*
130. AGPV, busta 43, 2nd April, 1762, (copia).
131. ASV, CSAM, busta 190, *Scritture* 1762-63, f.15v.
132. *Ibid.*, ff.15v-16r.
133. V. Mallia-Milanes, "Some Aspects...", pp.515-520.
134. ASV, CSAM, busta 190, *Scritture* 1762-63, f.16r.
135. See note 80 above.
136. B. Blouet, *The Story of Malta*, London 1967, pp.124-125.
137. ASV, CSAM, busta 190, *Scritture* 1762-63, f.16r.
138. "Proposizioni del Cav. Buzzaccarini: Capitolj che si propongono per essere confirmatj da S.A.E. con suo Decreto". AOM 1518, August, 1763. ASV, MBG, 19th August, 1763.
139. AOM 1518, August 1763. ASV, CSAM, busta 190, f.16v.
140. *Ibid.*
141. *Ibid.* See also ASV, MBG, 18th August, 1763 and ASV, CSAM, *prima serie*, filza 99, f.130.
142. ASV, MBG, 19th August, 1763.
143. ASV, CSAM, busta 190, f.17r.
144. ASV, MBG, 19th August, 10th September, 1763.
145. ASV, CSAM, busta 190, f.17r.
146. *Ibid.*, f.17v.
147. AGPV, busta 43 (unpaginated).
148. The first three, together with Carlo Grech Delicata, had been described in another document as "the names of the pricipal Maltese merchants". *Ibid.*
149. *Ibid.*
150. *Ibid.*, *Scritture* 24th February, 1769. ASV, CSAM, *Diversorum*, busta 396, fasc. 126, *scrittura* 2, 27th September, 1784.
151. Every 3½ Venetian *stata* were equivalent to 1 Maltese *salma*. ASV, MBG, 10th January, 1764 MV. For a definition and value of the *salma* as a unit of weighing grain, see F.F. Olesa Munido, *La Organizacion Naval de los Estados Mediterraneoos en Especial de Espana durante los Siglos XVI y XVII*, Madrid 1968, I, pp.246-247.
152. ASV, CSAM, *Diversorum*, busta 396, fasc. 126, *scrittura* 2.
153. *Ibid.*, *scrittura* 9/E, 20th December, 1781.
154. On the history of Denmark, see L. Krabbe, *Histoire de Denemark*, Paris 1950.
155. ASV, MBG, 30th June, 10th August, 1761. On the Danish expedition of 1761-67, see T. Hansen, *Arabia Felix*, London 1964. On its relations with Malta, see *ibid.*, p.75f.
156. See A. Sacerdoti, "La mission a Alger du Consul de Venise Nicolas Rosalem", *Revue Africaine* XCVI (1952), pp.64-104. *Id.*, "Venise et les Regences d'Alger, Tunis et Tripoli 1699-1764", *Revue Africaine* CI (1957).
157. See V. Marchesi, *Tunesi e Venezia nel secolo XVIII*, Venice 1882.
158. See G. Cappovin, *Tripoli e Venezia nel secolo XVIII*, Verbania 1942. F. Corò, *Il*

- Consolato della Repubblica di Venezia a Tripoli dal 1764 al 1797*, Tripoli 1955.
159. See V. Marchesi, "La Repubblica Veneta e il Marocco", *Rivista Storica Italiana* III (1886).
  160. R. Cessi, *Storia della Repubblica di Venezia II*, Milan 1968, p.237.
  161. ASV, MBG, 27th January, 1765 MV.
  164. *Ibid.*, 10th May, 14th June, 23rd July, 1756. See also V. Paradis, *Alger au XVIIIe Siecle*, Alger 1898.
  165. M. Nani Mocenigo, "La marina della Religione di Malta", *Ateneo Veneto* CXXVIII, 2 (1937), p.81.
  166. See S. Bono, *I corsari barbareschi*, Turin 1964. G. Fisher, *Barbary Legend: War, Trade and Piracy in North Africa, 1415-1830*, Oxford 1957. H.D. de Grammont, "Etudes Algeriennes: La course, l'esclavage et la redemption à Alger", *Revue Historique* XXV-XXV (1884-85). P. Grandchamp, *La Correspondance des Consuls d'Alger, 1690-1742*, Alger 1890. M.S. Anderson, "Great Britain and the Barbary States in the eighteenth Century" *Bulletin of the Institute of Historical Research* XXIX (1956).
  167. ASV, MBG, 14th April, 1755.
  168. *Ibid.*, 2nd December, 1756.
  169. *Ibid.* See also *ibid.*, 15th March 1757; 11th January, 1762 MV and 30th August, 1764.
  170. See *ibid.*, 12th March, 30th April, 13th May, 1764; 2nd December, 1765; 29th January, 13th February, 1765 MV; 24th March, 21st April, 12th May, and 29th August, 1766.
  171. *Ibid.*, 7th June, 1764.
  172. That is on 6th July, 1781.
  173. ASV, CSAM, *prima serie*, busta 711, 14th July, 1781.
  174. S. Bono, *op.cit.*, p.64.
  175. R.S. Anderson, *Naval Wars in the Levant 1559-1853*, Liverpool 1952, p.310.
  176. See V. Mallia-Milanes, "The Buona Unione", *loc.cit.*
  177. See *id.*, "Some Aspects...", pp.536-43, 552-53.
  178. See G. Boerio, *Dizionario del Dialetto Veneziano*, 2nd Edition, Venice 1856, p.361 *sub voce*.
  179. On Veneto-Maltese timber trade in the eighteenth century, see V. Mallia-Milanes, "Some Aspects.....", pp. 533-536.
  180. *Ibid.*, pp.530-533.
  181. ASV., MBG, despatches from 1764 onwards, *passim*.
  182. ASV, CSAM, busta 909 and busta 910, *passim*.
  183. *Ibid.*, *Diversorum*, busta 396, fasc. 126, *scrittura* 2, 27th September, 1784.
  184. ASV, CSAM, *prima serie*, busta 711, 9th October, 1782.
  185. P. Earle, *op.cit.*, pp.269-270. R. Cavaliero, "The Decline of the Maltese Corso...", pp.224-238.
  186. ASV, CSAM, *Diversorum*, busta 396, fasc. 126, *scrittura* 2, 27th September, 1784.
  187. *Ibid.*
  188. *Ibid.*
  189. *Ibid.*
  190. *Ibid.*
  191. *Ibid.*
  192. AIM, *Corr.* 100, f.278, 16th January, 1765.
  193. ASV, CSAM, *Diversorum*, busta 403, fasc. 76, 21st March, 11th April, 1793.

TABLE A

“Merci soggette al Diritto di Nuovo Imposto oltre il Diritto di Dogana”

ARTICLES	Unit of Measurement	Scudi	Tari	Grani
Coia pelose di Bovi, e Vacche grandi ...	coio	—	2	—
Li Merrani ... ..	coio	—	1	10
Vitelline ... ..	coio	—	—	10
Pelli d'agnello pelose ... ..	cento	—	6	—
Sola e Vacchetta di Ponente e Levante	cantaro	2	—	—
Infodere, ossia Barrane ... ..	Dozana	—	1	—
Camuscie bianche ... ..	dozana	—	1	—
[Camuscie] di colore ad olio ... ..	dozana	—	2	—
Montonine ... ..	dozana	—	2	—
Vitelline ... ..	dozana	—	6	—
Bragotti ... ..	dozana	—	6	—
Alacche rosse e gialle ... ..	dozana	—	6	—
Vacchette di Fiandra ... ..	pelle	—	3	—
Carta da scrivere di Veneria ... ..	cassa	3	—	—
Carta bruna grande da straccio ... ..	ballone	—	1	—
Carta fina, carta reale e castarda ... ..	risma	—	3	—
Carta da campana di Francia ... ..	ballone	2	—	—
Cartone ... ..	cantaro	4	—	—
Cordovane ... ..	dozana	—	4	—
Tabacco in foglia di Levante ... ..	cantaro	2	6	—
Mendicanti ... ..				
Tabacco avana, Spagna ed in carotte	cantaro	2	1	—
d'ogni qualità ... ..	cantaro	7	—	—
Mendicanti ... ..	cantaro	5	—	—
Caffè di Levante ... ..	cantaro	3	—	—
[Caffè] di Ponente ... ..	cantaro	2	4	—
Acquavite ... ..	barile	—	6	—
Sapone in pietra fino ... ..	cantaro	2	—	—
Sapone ordinario ... ..	cantaro	1	—	—
Sapone liquido ... ..	cantaro	—	6	—



TABLE B

“Merci soggette al Diritto dell'Università oltre il Diritto di Dogana”

ARTICLES	Unit of			
	Measurement	Scudi	Tari'	Grani
Cimino dolce, ed agro ... ..	cantaro	—	—	10
Sapone d'ogni specie ... ..	cantaro	—	1	10
Cottone filato ... ..	cantaro	—	2	—
Cottone in lana e cornuto ... ..	cantaro	—	1	—
Cottone con semenza, ed in cocca si riduce in cotone in lana ... ..	cantaro	—	1	—

TABLE C

“Altre [mercìe] soggette al solo diritto dell'Università”

ARTICLES	Unit of			
	Measurement...	Scudi	Tari'	Grani
Vino ... ..	Botte di 22			
Diritto d'Abbatia ... ..	Barili	—	2	10
Vino musto ... ..	Botte	—	6	—
Diritto d'Abbatia ... ..		—	2	—
Formaggio della Sicilia e Morea ... ..	Botte	—	4	—
Casciocavallo ... ..	Cantaro	—	2	—
Formaggio scaldato ... ..	Cantaro	—	2	—
Olio ... ..	Cantaro	—	2	—
Ogno sorte di carne salata e salami ... ..	Ogni 100 Cantaro	1	—	—
Formento ... ..	Cantaro	—	2	—
Sarde Tonnina ed Ancioie salate ... ..	Salma	—	—	16
Surra ... ..	Barile	—	—	5
	Barile	—	—	10

TABLE D

## "TARIFFA PER IL CONSOLE RESIDENTE IN MALTA"

	Scudi	Tari	Grani
Per ogni Nave Polacca, o altro Bastimento che naviga con valle quadre, negli alberi di Maestra e Trinchetto ... ..	6	6	10
Per ogni altro Bastimento che naviga con valle quadre nel solo albero di Maestro, o Trinchetto ... ..	3	6	—
Per ogni tartana con poppa piatta, e vele latine ...	1	4	—
Per pinco, pincotto, martingana, pandoria, fregatella, o altro simile bastimento latino ... ..	1	—	—
Per schifazzo, filuca, bergantino o speronara che porti caicco ... ..	—	8	—
Per schifazzo tarantino, guzzo, lentello, bergantino, filucca e speronara a due alberi senza caicco ...	—	4	—
Per filucca speronara o altro simile bastimento a ramo, con un albero ... ..	—	2	—

SOURCE: ASV, CSAM, *busta* 943.

**APPENDIX**

**MASSIMILIANO BUZZACCARINI GONZAGA'S FOUR QUARTERS OF NOBILITY**

ARMA BUZZACCARINA	ARMA LEONI	ARMA PINBIOLA	ARMA CUMANO
Arcoano	Francesco detto Checo	Francesco Engelfreddj	Giacomo
Francesco	Paolo	Pietro Bono	Rinaldo
Arcoano	Leonello	Sebastiano	Giacomo
Agostino	Francesco	Pimbiolo	Gasparo
Lodovico	Gentile	Ottaviano	Giacomo
Francesco	Co. Girolamo	Gio. Fran.co	Claudio
Brunoro	Co. Leonelli	Annibale	Giacomo
Vincislao	Co. Girolamo	Lorenzo D.r	Glaudio
Brunoro =	Beatrice Co. Leoni	Lorenzo	Giacomo
		Girolamo =	Laura Cumano
			Claudio
			Chiara Pimbiolo Engelfreddi
			<i>Madre</i>

SOURCE. AGPV, busta 166, n.26

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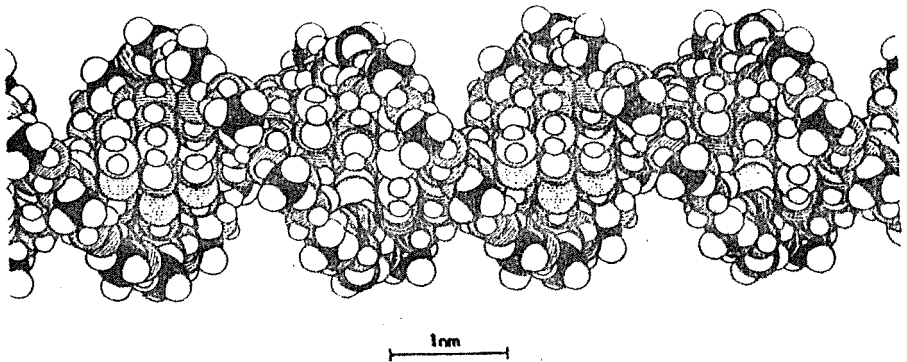
# HEREDITY: A FACT THAT CAN BE TAMPERED WITH?

**Rena Balzan**

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The characteristics of every living organism are the product of the interaction between heredity and the environment. Heredity supplies the individual with a set of characteristics which can be modified to a considerable extent by environmental factors. Rabbits of the Himalayan breed for example develop black pigment at the tips of the nose, tail, feet and ears in the usual range of environments. How-

his garden peas, he laid the foundations of what was going to be the 'core' of the Modern Biological Sciences. Mendel knew nothing about chromosome and meiosis, a form of nuclear division that halves the chromosome number, yet he depicted that a plant with 2 factors, (or genes), one for round shaped peas, the other for wrinkled shaped peas would only transmit one of these factors through



The double-helical DNA molecule formed by intertwining of two DNA chains of complementary base sequence. (From Feughelman *et al.*, 1955.)

ever, if raised at very high temperatures, an all white rabbit is produced. Also the flowers of hydrangea may be blue if grown in acid soil or pinkish if grown in alkaline soil.

When in 1866 Gregor Mendel published his results after a series of observations on the colour and shape of

a gamete to its offspring. He also stated that the segregation of one factor pair was independent of the segregation of another factor pair. The significance of Mendel's results was not realised until their rediscovery in 1900, and in 1903 Sutton suggested that hereditary factors or genes were carried on chro-

mosomes. This hypothesis was confirmed later by Morgan while working on the chromosomes of the fruit-fly, *Drosophila*. The chromosomes, which are found in the nucleus of the cell, have distinct staining properties. In fact, in 1924, Feulgen developed a stain which has shown the presence of the deoxyribose form of nucleic acid (DNA) in the chromosomes. The DNA, which consists of phosphoric acid, a pentose sugar and nitrogenous bases, form in conjunction with a protein matrix the material of the chromosome. The DNA molecule has the capacity for self-replication, its stability being an important factor in its passing intact from parent to offspring. On rare occasions, however, a change in the DNA molecule may arise spontaneously. This is known as a mutation and may result in a defective protein or the complete absence of a protein. The net result is often a change in the the organism or a change in some character or trait of the organism. Healthy people have a gene that specifies the protein structure of the red blood cell pigment called haemoglobin. A mutation may arise in this gene that gives rise to a defective haemoglobin protein. This is the case with some anaemic individuals, where as a result of this gene mutation, the defective haemoglobin is unable to carry the right amount of oxygen to the body cells.

Besides the gene mutations, there can also be chromosomal mutations. Breaks can occur in the chromosomes, and chromosomal material may be lost or displaced. This means lost or displaced genes and if the mutation occurs in the germ cells and is transmitted from the parent to the offspring, a

phenotypically changed (abnormal) offspring may result.

Mutations, which may thus be defined as heritable alterations in the genotype, may also be induced. Ionizing radiations, ultra violet light and certain chemicals induce mutations and are known as mutagenic agents. In 1927, Muller demonstrated that X rays could induce mutations in *Drosophila*. A year later Stadler proved the mutagenic effect of X rays on barley. Since that time X rays have been used to induce a large number of mutations in many organisms. These mutants have served as landmarks that could be followed from one generation to the next in the transmission of genetic material. Also, with the awareness of the harm that can be induced by ionizing radiations in living organisms, more care is being taken about the use of X rays and in particular about the doses used.

Organisms belonging to a particular species have got a specific number of chromosomes per cell. Thus in normal human beings there are 46 chromosomes in each cell, these being found as 23 pairs of homologous chromosomes. Each pair of chromosomes have identical genes (or their mutant forms) located at corresponding loci.

In the dog's cell the number of chromosomes is 78, while in the cat's it is 38. This is referred to as the diploid number of chromosomes. During gametogenesis, that is during the formation of the egg and sperm in animals or ovule and pollen grain in plants, the chromosomal number is halved by the reduction division known as meiosis, so that each gamete will contain the haploid number of chromosomes. This

means that each human gamete (egg or sperm) will have 23 chromosomes. When fertilization takes place and fusion of the gametes results, the new zygotic cell that is formed and that will give rise to a new individual will have again 46 chromosomes.

A mutation may also involve a change in the chromosomal number. Thus an individual may possess one or more sets of homologous chromosomes in excess of the normal diploid set and in this case it is referred to as a polyploid organism. The normal tomato plant has 24 chromosomes in each cell, whereas a polyploid tomato plant would contain 36 or 48 or even more chromosomes per cell.

In some cases, instead of having one or more sets of chromosomes being added to the normal diploid number, there may be the addition (or loss) of just one or more chromosomes, a phenomenon that is known as aneuploidy. Thus, the mongol is an aneuploid individual with 47 instead of the normal 46 chromosomes per cell. An extra chromosome labelled number 21 gives rise to a set of abnormalities which are referred to collectively as Down's syndrome.

Once it was thought that polyploidy was quite common in plant species. However, we now know that it is quite rare in natural populations. In modern plant breeding, polyploids are being artificially induced by an alkaloid drug known as colchicine. This method of inducing polyploidy artificially is important in obtaining new agricultural and horticultural varieties. Polyploid plants are in general larger than their related diploids, this being due to an increase in cell size. In fact there is

an increase of various plant parts, including an increase in the size of the flowers and fruits which makes polyploids commercially important.

Much of the emphasis in plant breeding has been on increasing agricultural productivity. This will be accomplished not only by the breeding of higher yielding varieties but also by the development of varieties that stabilize production through resistance to disease, drought, heat, cold and wind. Mendelian diversity arises through gene mutations that are very essential for evolution to take place. Sometimes a single mutation may enhance the usefulness of a species to man. Cauliflower, Brussels sprouts and Kohlrabi have all been derived from the wild cabbage. The great morphological differences between the cultivated types and the wild type are due to a few gene differences.

Another method of evolution of cultivated plants depends on the crossing of distinct species with the preservation of improved types from the products. When distinct species are crossed, the offspring, if any, tends towards a high grade of sterility. In order to preserve the vigour which characterizes many such interspecific hybrids, vegetative propagation, such as budding or grafting, has to be used. Certain varieties of pears, plums, cherries, and grapes have arisen from interspecific hybridization, as have many flowers such as certain irises, roses, lilies and rhododendrons.

Organisms showing advantageous characteristics are usually favoured by artificial selection both in plant and animal breeding. Very often, inbreeding, which is the mating of close-

ly related individuals such as self-pollination in plants or brother-sister matings in animals is employed. By this method, advantageous characteristics will be preserved. However, there is a great probability that recessive (or hidden) traits, many of which are deleterious, will begin to appear. In fact, one of the consequences of inbreeding is a loss in vigour. This can be seen quite clearly in some pure breeds of dogs. Dog breeders very often favour certain characteristics in a particular breed which they try to preserve as much as possible by inbreeding. The result is that many dogs win prizes in dog shows, but are otherwise weakened physically and rendered less resistant to some diseases.

A remedy for this 'inbreeding depression', both in animals and plants, is to cross distinct inbred lines. These crosses usually produce a vigorous hybrid generation. This hybrid vigour, such as increased size, fecundity, or

resistance to disease is known as heterosis and even species that seem to show little or no harmful effects from inbreeding, frequently benefit from such crossing.

The study of genetics has opened wide horizons in the study of life and with the development of plant and animal tissue and cell culture techniques new perspectives have arisen. There is still much to be done in this field and the big question is whether through a better understanding and better use of the hereditary mechanism, some of the major problems in the world, including the seemingly inadequate food supply and a large number of hereditary diseases, will be solved.

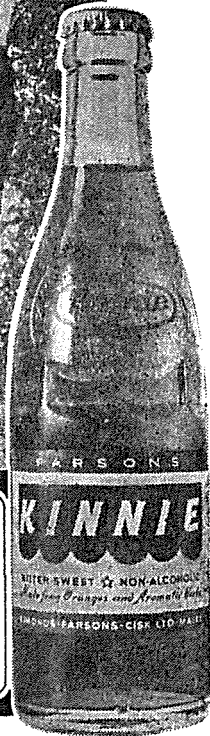
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**BE ON THE SCENE  
WITH *KINNIE***

**MALTA'S MOST POPULAR DRINK**





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# BLACK AND WHITE POSITIVE SLIDES

**George Agius/Frank Ventura**

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Photography was always a popular pastime, and with the ever increasing availability of cameras, films and other equipment, more people are taking it up as a hobby. Many are interested enough to do their own developing and printing black and white photographs. A few, even more ambitious than others, have ventured with the printing of coloured photographs. However the production of a photograph involves the use of expensive enlarging equipment, printing paper, and a lengthy and laborious process in a dimly lit or completely dark room. Most people may for various reasons, not want to procure the enlarging equipment and many more are deterred by the time consuming process and by the lack of suitable darkroom facilities.

Alternatively one can make use of slides. These can of course be used for various purposes such as photographing useful or complex diagrams from books or as a means of presenting useful information to an audience during a talk or perhaps in recording a sequence of events. Unfortunately the 'process' colour slides are somewhat expensive if extensive use is to be made of them. With this in mind, we are therefore proposing the use of black and white positive slides. These can be easily produced by a short simple process, using an ordinary negative film, without any special equipment or darkroom facilities. It should be noticed that this process can produce positive slides directly from the negative film in the

camera. In other words there is *no need* to develop a negative and then reexpose another negative to get a positive.

A survey of photographic literature shows that most of the normal negative films can be processed to give black and white positives. However, many references point out that the process is rather difficult and that no generally applicable formula can be used. On experimenting with some of the generally available films it was found that the published processes lacked sufficient details for specific films. Therefore it was decided to work out the necessary details for one particular film ILFORD HP4, which seemed to give the best results during our trials. A general procedure, which is applicable to all negative films, should help in understanding the processes involved.

1. The exposed film is first developed in an energetic developer which ensures that every exposed grain in the emulsion is developed (Fig. 1 and 2).

2. The silver negative image so developed is then dissolved away completely with a suitable silver solvent, normally an oxidizing agent like potassium dichromate (VI) or potassium manganate (VII) (permanganate), without affecting the undeveloped silver halides.

3. The negative is rinsed and treated with sodium sulphate (IV). The emulsion still carries a positive image in the form of undeveloped silver halides. (Fig. 3)

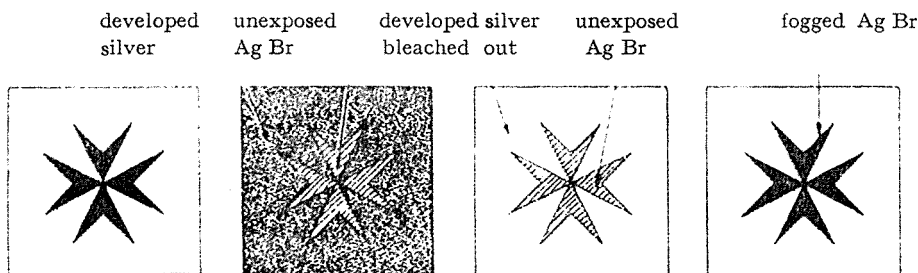


Figure 1. Original image

Figure 2. After first development

Figure 3. After bleach and clear

Figure 4. After fogging, same image as original

4. The silver halides remaining are fogged. This fogging may be carried out either by exposing to light followed by normal developing and fixing, or by chemical means followed by fixing (Fig. 4)

## EXPOSURE

The exposure of the negative is a very important and critical step in obtaining good black and white positives. Ilford HP4 has a film speed rating of ASA400; however for the purposes of black and white reversal it must be assumed that the film has a rating of ASA 25. This is the film speed rating which has to be used in calculating the appropriate aperture and time. If an automatic exposure meter is incorporated in the camera the film speed is set at ASA 25 mark and exposures are then made in the normal way. This limits the speed of the film considerably, so other film speed ratings up to 100 ASA were tried. The results obtained with higher film speed ratings were acceptable but slightly too dense.

## LOADING FILM ON SPIRAL

When the film is exposed it is re-

wound into its cassette in the camera. The film is then transferred from its cassette to the spiral of a developing tank. (The latter can be purchased at a low cost from photographic dealers.) Instructions as how to load the spiral can be found with the tank. The important thing to note here is that this operation must be carried out in total darkness. If no darkroom facilities are available, the loading can be carried out by covering both hands with several layers of thick cloth, thus creating a light-tight compartment. It is best to work in a room with subdued lights. The loaded spiral is placed (always under cloth cover) in the developing tank and the lid put on (the latter two items being initially introduced under the cloth before the spiral loading operation is started). The tank with the lid on is now light-tight and all other operations can then be carried out in full daylight.

## CHEMICAL PROCESSING

The temperature of the various solutions was maintained at 20 + or - 1 C. The agitation method adopted during the process was the so called inversion method, that is, the tank is inverted regularly once every minute

during the processing time except for the water washes.

**Wetting:** The tank is filled with water, agitated for a few seconds and emptied.

**Development:** A general purpose negative developer which can be purchased at low cost from photographic dealers is used at four times normal strength and 5g/1 of sodium thiosulphate crystals. One such developer is for example Tentax S420. Other developers can of course be used provided (a) they are used at three times normal strength (b) sodium thiosulphate crystals are added and (c) development time is the same as recommended for the negative. For the more enthusiastic we are here reproducing a negative developer formula which we have tried successfully.

Metol	3.1g
Hydroquinone	5.9g
Sodium metabisulphite	2.1g
Sodium sulphite (anhyd.)	90.0g
Sodium carbonate	11.5g
Potassium bromide	1.7g
plus Sodium thiosulphate crystals	5.0g
Water	to one litre

The time for this development is 12 minutes.

**Water Wash:** Developer is poured out and the film washed repeatedly with water for three minutes.

**Bleaching:** The film is now treated for five minutes with a solution containing:

Potassium dichromate	5.0g
Concentrated sulphuric acid	2.7cm <sup>3</sup> .
Distilled water	to 1 litre.

**Water Wash:** The film is rinsed

with water for three minutes.

**Clearing:** The film is allowed to soak for 2 minutes in a clearing solution which contains:

Sodium sulphite	50g
Sodium hydroxide	1g

**Water Wash:** The film is rinsed with water for three minutes.

**Chemical Fogging:** This method of fogging was preferred to re-exposure of the film to light, because it only involves the addition of a further solution to the tank. Light exposure would have involved the unwinding of the film from the spiral and exposing it evenly to white light of a particular intensity. However chemical fogging produces an image with a slight dark brown tinge. The solution used for chemical fogging is:

Thiourea	1g
Sodium hydroxide	4g
Potassium bromide	40g
Water	to one litre.

The film was treated with this solution for two minutes. At this stage the positive is ready and the film can be taken out of the tank and checked to see whether it requires further darkening.

**Water Wash:** The film is rinsed repeatedly with water for two minutes.

**Fixing:** The film is fixed (10 minutes) to ensure that no undeveloped silver bromide is left. The fixing solution can be purchased ready weighed to be made up in solution. However, here we are again reproducing a suitable fixer formula:

Sodium thiosulphate crystals  
240g  
Potassium hydrogen sulphite 5g  
Water to 1 litre.

*Final Wash:* The film is rinsed with running water for 15 minutes.

*Drying:* The film is allowed to dry in dust-free atmosphere. The final result is a slide of good definition, with tonal range. The graininess which is usually evident in enlarged prints made from HP 4 negative film, is in the case of projected slides not evident at all.

Finally, it should be mentioned that all the solutions mentioned can be used more than once. The developing, clearing and fixing solutions can be

used about six times. In the case of the developer 1g of sodium thiosulphate should be added each time. The bleaching solution can be used about three times if it is filtered or allowed to settle. The fogging solution can be reused provided that 1g of sodium hydroxide and  $\frac{1}{2}$ g of thiourea are added each time.

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# ANTONY: THE SHAKESPEAREAN COLOSSUS – Part I

**David Cremona**

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Shakespeare's personages are always of compelling interest, even within the limitations imposed within 'the three hours' traffic' of a single play. But how much more fascinating it is in those instances where they reappear in a second, sometimes even in a third, play, to follow their fortunes and observe how character broadens under wider vicissitude, where the spectrum of emotion and action may display itself more freely. With this increased range, something of a pattern of development in character is more readily discernible, imposed partly by the exigencies of the playwright, partly shaped by the creative dynamism of the poet, and to some extent determined by known historical truth, to which even so free an adapter as Shakespeare is finally answerable, if in broad outline. For it is in the historical plays that this pattern occurs; and most commonly in the close sequence of the Chronicles, especially those two tetralogies which cover the history of the English crown uninterruptedly from the late fourteenth to the late fifteenth centuries. Yet the term 'historical' must be allowed to include the two Roman plays *Julius Caesar* and *Antony and Cleopatra* at the least; their historicity, unlike that of *Coriolanus* or *Titus Andronicus*, is at least as valid as that of the English se-

quence. That they are themselves in close sequence (for all their difference in theme and treatment) is undeniable: the events at the beginning of the second play are felt to derive immediately from those at the close of the first; and both are concerned with (among other issues) the figure of the world dominator, the man who 'doth bestride this petty world/Like a Colossus'.

Generally, a strong, and often an unsympathetic, character emerges in the course of the first play; he intrigues and fights his way to power, single-mindedly and more or less ruthlessly, usually to the detriment of the legitimate or at least the established ruler; and he becomes in the later play himself the target, and sometimes the victim, of just such a man as he had himself been: young, vigorous and confident. By this time, his exercise of statecraft and perhaps belated stirrings of conscience have wearied and embittered him; and though he must react, and may do so firmly, it is with a divided mind and a disillusioned heart. It is the sour paradox which Macbeth presciently recognises: bloody instructions, being taught, return to plague the inventor. Already, as early as *Henry VI* part 3 and *Richard III*, Shakespeare had conceived the figure of Richard of Gloucester

plotting and murdering his way to the English crown, only to have another contentent wrest it from him as bloodily. It must be said, however, that much of the rise of Richard, as well as his fall, is confined to the play which bears his name, with those brief appearances in *Henry VI Part 3* serving only as a sinister prologue; moreover, Henry of Richmond is presented in an exclusively sympathetic light, as much the redeemer and champion of a suffering England as Malcolm was to be of a Scotland terrorised by Macbeth. It is with the second Richard and his overmighty cousin and vassal Henry of Bolingbroke (who claims indeed to be acting on behalf of an oppressed country, but insincerely) that the pattern asserts itself more firmly. Between the plays *Richard II* and *Henry IV Parts 1 and 2*, there is a steady shift in perspective and focus; time and circumstance switch the roles of agent and victim, so that the wasteful and unjust king Richard becomes in retrospect a 'sweet lovely rose' to avenge whose death (in theory) a host of powerful nobles rise in arms, whereas the former darling of the crowds, Bolingbroke, is now seen as a thorn, a canker to be destroyed by the very magnates that had set him up in power; these in turn have their own candidate, a chivalrous and gifted soldier, generous in his youthful spirits and universally admired. Analogously, though in reverse, Bolingbroke's son Hal, to all appearance a wastrel, dissolute and anarchic, develops into the perfect king, embodying the energy and aspirations of his subjects. Like his father, he has three plays for his progress, though

the third — some minor action quickly disposed of — is purely triumphal in character. In comic counterpoint to this pattern are the fortunes of Falstaff, whose bulk also has three plays to sprawl in; but while he shares two with Hal, whose foil he is in so many respects, the third is his own. Throughout, there is a regression; as more, and more searching, scrutiny is brought to bear, the charm and vitality wear a little thin; and even if we are led to question whether the Falstaff at Windsor is at all the same man as the Sir John of Eastcheap and Gadshill — he is neither particularly witty in himself nor the cause that much wit is in other men — yet the changes have already occurred between the two parts of *Henry IV*; between and during, it should be said. If *The Merry Wives of Windsor* is to be considered a Falstaff play, it constitutes an exception (such as proves the rule) to the pattern, in that it is a self-contained farce, not at all concerned with power, political intrigue and warfare civil or international. And it is with these that we must deal.

Indeed, the Roman plays we are to discuss reflect the same concerns as the chronicle plays, only writ large; it is not the nation, however dear, but the world which is at stake. And if the stage is that much the greater, so correspondingly are the actors; and every device of the poet-playwright is called into play to amplify character and event. Yet there is little here of the epic mode and less of the grandiose and hollow heroics with a corrupt French taste was to make fashionable in England within the century. The setting is Rome: Rome in both its aspects, as the world-city, and the

Roman world. The first is, appropriately, the background of *Julius Caesar* — indeed it is a fitting backdrop to him and to the conservative Roman virtues of the conspirators; as the theme grows increasingly imperial, the action must leave the claustrophobic confines of the *urbs* and play itself out against the universal panorama which is now the newer Rome, the real Rome. The conflict between the two Romes is, in some sort, the matter of that play; while the vertiginous rushing to and fro between three continents, with land marching and sea fighting, and the dimension of air itself invaded by the sheer mass of the protagonists — all these typify a world stamped with the Roman sigil; stamped so firmly that even as self-consciously exotic a character as Cleopatra, the antithesis to Roman intransigence and rigidity, when she enters upon a ritual of apotheosis (it is scarcely felt to be less), does so 'in the high Roman fashion'. And Antony her compeer, at once the epitome and the negation of *Romanitas*, is in the end not shamed in defeat: 'A Roman by a Roman valiantly vanquished.' Yet the paradoxes multiply: the final tableau is esoteric — in Roman terms, bizarre and outrageous. Or is it simply that the Roman imperium cannot compass Elysium?

The Mark Antony whom we meet in *Julius Caesar* certainly has no Olympian associations; he is allowed to emerge only very gradually from the ranks of Caesar's friends, and then in no very heroic light. He appears, it is true, as early as the second scene, and is constantly in the mind of the leading characters, but the emphasis of

thought and tone throughout the first two acts is subtly directed — and at times not so subtly — towards a depreciation of his worth and ability. Not that there is any deliberate falsification; Cassius, 'a keen observer', is wary of him as a potential threat, and says as much more than once. But Shakespeare has been very careful to let us see him, in the main, through the indulgent eyes of Caesar or the dismissive one of Brutus; he is an intimate of Caesar's, indeed, but one whom the dictator treats as a young man about town, frivolous, self-indulgent, not to be taken too seriously: a playboy. And the assessment is one in which Brutus — and most Romans? — concur. As against this, it is Antony who offers Caesar 'a kingly crown' — and on a particularly public occasion; more, he is insistent. This has its effect with Cassius, who moreover fears him, not only for the 'ingrafted love he bears to Caesar', but also for the 'means' at his disposal which make him a considerable danger. Brutus, as opinionated as most 'noble' men, refuses to consider Antony dangerous; he will not have him killed with Caesar when Cassius urges that their security demands no less. Rather, generous to the point of folly, sympathising with Antony's very real sorrow over the haggled body of Caesar, he permits him to speak at Caesar's funeral. And unleashes havoc: the rousing of the *plebs* to hysterical fury against the assassins of Caesar, the flight of these from Rome; the proscription of their friends and well-wishers left behind; the mustering of a force sufficient to pursue and eventually defeat them, and their own desperate



suicides after the frustration of all their lofty hopes for Rome and for the world: all these stem from Brutus' short-sightedness, from a tragic mis-assessment of the "playboy" Antony. Caesar had been killed so that Rome should not 'stand under one man's awe'; lest he should be crowned king and exercise total tyranny, over-riding the free Roman spirit and suppressing the aristocratic oligarchy which had obtained since the time of the first Brutus and his expulsion of the original Tarquin kings, centuries earlier. Yet already, by the end of *Julius Caesar*, most of the Roman liberties had been forfeited; the grip on the state of the triumvirate was far stronger and more pitiless than Caesar's had ever needed to be; and a deliberate policy of pogrom and repression had been instituted. There are clear hints, certainly, of disharmony even within the triumvirate, indications of unrest and petulance which bode ill for the new stability of the world-city, the seeds of that disunity that makes much of the interest in *Antony and Cleopatra* where, after much suspicion, intrigue, treachery, politicking and — inevitably — war, Rome and the world end up more absolutely under one man's awe than ever. To all this, Antony has been the catalyst.

Our first glimpse of him is interesting even visually. It is the feast of the Lupercalia, and the dictator-for-life Caesar, accompanied by a press of patricians and senators of the Roman republic — among them several men who soon enough reveal themselves to be disaffected to his regime — is combining an official religious cere-

mony with something like a personal triumphal progress. He is not unaware of the resentment, muzzled yet smouldering, in some of his train, notably Cassius, and he calls his military commander and close friend to him for private instruction. Antony, Master of Caesar's horse, is not here in his military capacity, nor is he in uniform. For that matter, he is not even in civilian dress — the long laticlave tunic and formal toga of a senator which one might call the Roman equivalent of morning coat and striped trousers. Rather he is in a singlet and running shorts; that is, he is dressed 'for the course' in the sacral version — a brief kilt or wraparound of wolfskin: his function in the ceremony being to run through the crowded streets hitting out at the bystanders with thongs in a traditional ritual of fertility. This neither invests him with any particular dignity — other athletic young men, similarly dressed, would be running with him — nor robs him of any, since it is a religious act. It does, perhaps, serve visually to pick him out from the more staidly garbed citizenry. That he should be among the first to be addressed by Caesar, and therefore identified by the audience, has its weight too, dramatically. He steps forward, receives his master's instructions with a nice blend of deference and affection, thus setting the tone of his attitude to Caesar, and promises compliance cheerfully. Later, he will offer him a crown, we hear — and it does not surprise us that it should be he, whether it is done through hero-worship, contrivance or irresponsibility; the options are still open, at this stage. In the meantime, Caesar's ob-

servation has given us some insight of a more particular nature: in contradiction to Cassius, he loves plays; he hears music; his manner is generally affable and reassuring — he is prompt in smoothing Caesar's irritable suspicions, generous (if superficial) in his judgment of Cassius. At least overtly: there is a suggestion, in Caesar's invitation to be more candid — 'tell me truly what thou think'st of him' — that Antony has merely been making conventional reassuring noises. And he departs the stage in close conference with Caesar, as the audience cannot fail to notice.

When, the conspiracy well under way, Decius Brutus suggests that killing Caesar may not in itself be enough to restore the pristine order to Rome, Cassius is quick to let us know *his* opinion of Antony, and his summing-up shows that he does, in fact, 'look quite through the deeds of men'. Antony, he feels, should not be permitted to survive his master, and he adduces three reasons: he is 'a shrewd contriver', he has 'means' — troops, power, prestige, wealth, influence, experience, following, and qualities of leadership as well as strategic ability — which constitute a vast threat to a state run by the murderers of Caesar since (the third reason) he is devotedly loyal to Caesar, and will undoubtedly employ those means to bring about their ruin. This point, the 'love' used in the strongest unself-conscious Shakespearean sense — is given great stress by Cassius' insistence on it. But Brutus will have none of it: to him, 'Antony is but a limb of Caesar's', powerless without his master to animate him, Cassius' further

protest is swept aside, and Antony dismissed from consideration as one more 'like to die' out of ineffectual mourning than live to be his avenger; one, moreover, 'given to sports, to wildness and much company': with all *that* that entails to the Puritanically sober Stoic. Trebonius compounds the error: Antony is no danger, far too shallow in character; probably treat it all as a huge joke one day. That they are both disastrously wrong, the conclusion confirms: but Shakespeare makes it clear that such is Antony's public reputation; his 'deeds' have given him no other, and only a Cassius can look beyond them to the inflexible will behind the hedonistic facade. Again, on the morning of the fatal Ides, Caesar's comment on the belated arrival of Antony to escort him to the Capitol, jocular in tone, is in keeping with this popular image of him. Antony has been revelling all the night, as usual; he's managed to present himself in time for Caesar's *levee* — just — no doubt with a hangover, and he good-humouredly — as well as respectfully — acknowledges the nudge. And very likely accepts the breakfast cup of wine that his master offers all round; the hair of the dog, perhaps. So that our last picture of Antony — winecup in hand, joking with his admired Caesar — fits in with the image Shakespeare has adroitly fobbed on us. And it is the last we see of that Antony.

Dramatically, of course, nothing could better be calculated to disarm any lingering suspicion in the minds of the tense conspirators; or equally, to put the audience off the track. This

Antony, we all feel, is assuredly no threat; to be safe, Trebonius will be commissioned to draw him aside from the proximity of Caesar in those fatal five minutes or so — why ask for trouble? After all, the stress of the moment might make the impulsive Antony react violently — as it might anybody. But there is little fear that, once Caesar is dead, he will not take the line of least resistance and acquiesce in the *fait accompli*; after a few maudlin tears, it may be. So the conspirators must think; and so, on the available evidence must we. Cassius' misgivings? But we all know men like that, hypertensive, neurotically suspicious: born worriers. No, clearly, on the evidence, Antony is what he is believed to be: a competent soldier, no doubt — he is of the officer class and tradition, after all; an intimate, even a *protégé* of Caesar's having the influence that good family and field rank must command; but essentially frivolous, a womaniser, a heavy drinker, spoilt, self-indulgent, dissolute; in a word, effete. One of the 'chariot-set', one of the archetypal members of the eternal city's eternal *dolce vita*.

The watershed — of the play as of Antony's character, and the connexion is deliberate — is the murder of Caesar; once more the hour produces the man. Though his first reaction is one of shock — which is what Trebonius means when he reports him as having fled to his house 'amazed' — within a few minutes he has come to terms with a totally unforeseen crisis and is putting out feelers to gauge the situation, in order to take the necessary counter-measures:

inevitably, he must 'play it by ear' for a while. Which is to say that he is in the best sense of the word, an opportunist, sure of himself when the walking is most wary. His own nobility of character no doubt prompts the balanced dignity of his message to Brutus; it is no cynicism however to see a strong will to survive in the overtures he makes to him. On the one hand, he insists on being 'satisfied', as the mob itself does, and his support is conditional on that; on the other, he knows the temperament of his man — it is significant that he addresses himself specifically to Brutus. The 'noble Brutus' is far more likely to be swayed by an appeal which stresses the worth and honest inflexibility of the appellant. As of course he is, to the extent of being moved to call him 'a wise and valiant Roman', with all the value that Brutus attaches to that noun. Policy and dignity are well combined with tact, and the approach works with Brutus as it would not have done 'if Cassius might have ruled'. Indeed Cassius remains unconvinced and apprehensive, though he is willing to let his native distrust (which he has nevertheless learnt to rely on) be over-ridden by his stronger-minded brother-in-law. Antony, when he appears under safe-conduct (prudent man that he is), broadens and refines on the ambivalent attitude his message had indicated; again compounded of the spontaneous and the insincere, though the first is deftly made to subserve the second. Sorrow, pity, horror, shock are combined with a reasonable and dignified demand for justification. How much of his invitation to the

conspirators to kill him too at such a moment is genuine emotional reaction, and how much it is calculated appeal to the sentiments of Brutus, in the sure knowledge that such a man would shrink from such a deed, it is neither possible nor profitable to speculate. Very likely both elements are there; he subordinates his real feelings to expediency, perhaps, or presents them in such a way that they are morally irresistible to Brutus. That he considers *him*, at least, to be one of 'the choice and master spirits of this age', I do not think we need doubt; for the rest ... We must remind ourselves too that he has been at some pains to prepare his ground; that safe-conduct is binding with a Brutus. In all conscience it is, as he is quick to make clear, a damnable situation for him. 'My credit now stands on such slippery ground / That one of two bad ways you must conceit me: / Either a coward or a flatterer'. Rather than dissemble his love for Caesar, he emphasises it, apostrophising the mangled corpse before the murderers, and only then turning to address them. His eulogy over Caesar's body is sincere — but with a man like Brutus, sincerity is the only policy: this bears repeating. If his emotions run away with him (but do they?), he catches himself up in time to reassure the impatient Cassius; he does so adroitly, yet persists in his request for 'satisfaction'. He is, at any rate, sufficiently master of himself to make a further request — casually, as it were: he would like to deliver the formal eulogy (customary with any man of eminence) over the body to the assembled *plebs*. Cassius' im-

mediate demurrals are again brushed aside by Brutus' generosity, but even Brutus has enough prudence to impose provisos and limitations. To these, Antony accedes — he can do no other. Once alone with the corpse, nevertheless, he makes it abundantly clear that he does not intend to abide by his word. He is not concerned with the philosophical abstractions of Rome and freedom which have animated Brutus so powerfully; rather is he driven by a savage and implacable desire for revenge, bloody and terrible — 'havoc' is his word. Private love is of infinitely more worth to him than public weal: though the love for a world-figure such as Caesar has something of the transcendental, almost the religious, about it, we are made to feel. His control is sufficient for him to contain his zeal; he can bide his time, bottling in even so elemental a passion: his head is master of his heart, though only the better to assuage it in the end. Both are of an intensity of strength unsuspected in the 'reveller' of the first acts. Meantime, the repulsive charade must be carried through; he has had to make a show of being 'meek and gentle with these butchers', even to shaking each man by 'his bloody hand': a triumph of will over aversion such as will be remarked on by Octavius Caesar in the second play. And it is at this juncture that Octavius enters the play, if only by proxy; Antony, firm and decisive amid the turbulence of his passions, gives quick directions for the safe bestowal of Octavius and lays the grounds for an offensive and defensive alliance with him against 'these bloody men'; even as the tears stream

down his face. In one brief scene, then, our entire image of Antony has been subverted: a crisis has shown him to be intellectually and morally strong, determined, far-sighted, quick to seize advantage, adroit in the face of hostility, courageous yet prudent, totally assured, mightily impassioned, at once ardent and cool-headed; above all, master of himself when bayed about with enemies. All the qualities latent in him are instantly and skilfully deployed with vigour and decisiveness; the hedonist is submerged in the man of action. For a while, anyway.

How this paragon turns the tables on the massed number of his enemies is a familiar story. In the face of a mob newly persuaded by the overt nobility and rational argument of Brutus, and consequently hostile to himself, and in the teeth of the conservative aristocracy of Rome — one man against the world — he sets out on the task of re-conquest. With an assured knowledge of (and an underlying contempt for) the Roman mob, he plays on their sentimentality, their hero-worship of the dictator, their cupidity, their herd-instinct, their love of destruction in turn; with cold-blooded detachment he whips them up into a hysterical frenzy and sic's them onto the conspirators. It is a fine — if chilling — exercise in rhetorical control; Hitler's recorded rallies at Nuremburg spring to mind as a parallel. As an instrument of vengeance, Antony is appallingly effective; as a moral man ... he sets mischief afoot, engineers civil riot, arson, looting, and wholesale murder, as the mob runs amok. Certainly, he achiev-

es his ends: the conspirators' houses are assaulted and gutted, they themselves forced to flee from the City in fear for their lives. By the time the orgy of hate and blind destruction has spent itself, and the situation has returned to some degrees of normality, the Caesarians are in command. For not least of the effects of Antony's speech and its aftermath is the creating of a power vacuum, into which Antony and Octavius have neatly stepped: the *plebs* have got into the habit of absolute government under Caesar — how it must have horrified Brutus to hear the crowd suggest that *he* should become Caesar; and a continuity with the earlier regime has been established by those who, by the association of friendship or kinship, and chiefly by the assertion of naked power, are Caesar's heirs. Young Octavius (more properly Octavianus; Augustus as he is to be) has the name and the blood — a collateral relation officially adopted by Caesar, whose prestige and loyalties he in some sort also inherits; Antony has the effective control of Rome, the command of Caesar's armies, of whom he is an experienced leader, and the temperament — newly discovered — to organise on a large scale. Moreover, he has acted, and been seen to act, as Caesar's avenger; indeed, he is still so engaged. And he has the hard-bitten practicality — another newly revealed trait — to make unpopular political decisions, and the ruthlessness to carry them out. It is he who co-opts the millionaire aristocrat Lepidus — for coldly expedient reasons of his own — to the new Com-

mittee of Three, set up on the model of the earlier Triumvirate of Caesar, Pompey the Great and Crassus. And it is he who dominates this committee: Octavius, whose extreme youth and inexperience are constantly stressed (even, with less justice, in the later play) is content for the time to be guided; to sit back and learn from the older man. It is an apprenticeship in *realpolitik*; Antony proves a surprisingly apt teacher; the pupil will in turn prove to be a fatally gifted learner, surpassing his tutor. But that is for the future. So far, he participates and assents in the new policy of power, approving a series of proscriptions that will ruthlessly rid them of all opposition within the newly-established totalitarian state. It is, at the least, a cold introduction to the ethics of power. Lepidus part too is chiefly to acquiesce in decisions already made by the senior partners; and, as Antony cynically remarks, 'to be sent on errands', as 'a slight unmeritable man'. Even so, he displays, as such men will, a small-minded petulance which Antony coolly indulges for a while: Antony's nephew Publius must die, if Lepidus' brother is to be condemned; it is all very chilling; the earlier hardness of Antony might be excused, springing as it did out of savage desire for revenge of a superman much loved. But this detached trafficking for lives, this organising of murder-lists almost by computer ... well, again this is an unsuspected Antony. The murder has coarsened as well as hardened Caesar's *protégé*. Meantime, he sneers at the absent Lepidus; and when Octavius naively remarks that 'he is a tried and valiant soldier', Antony

shrugs this off as of no account. It is a dangerous lesson for Octavius to learn: dangerous for Antony, who is himself pre-eminently a soldier of courage and experience. If these count for so little ... Octavius will remember. Meanwhile, he allows Antony to direct both the civil administration and the military preparations.

The assassins of Caesar are duly pursued and forced to give battle at Philippi. Antony, the skilled strategist, has expected his opposite number Cassius to be directing the enemy forces, and has laid his plans accordingly. He is not to know that the half-baked theorist Brutus has now established such moral dominance over his partner, for all that he rightly claims to be 'the older soldier', abler than Brutus 'to make conditions', that Cassius reluctantly lets himself be overruled by Brutus' sophistries. Interestingly, Octavius makes capital of this apparent misreading of enemy strategy to twit Antony rather childishly, but his confidence is not to be shaken; a good practical psychologist, he sees through the bravado of the manœuvre and is contemptuous of the enemy morale. In turn, he marshals their own troops and assigns posts of responsibility. Again Octavius asserts himself, rather more firmly this time, though to as little practical purpose: he declines command of the left flank of the Caesarian army, to which Antony has assigned him, and insists on the right; apparently for no better reason than that he 'will have it so'. Or at least so he replies to Antony's irritated query: 'Why do you cross me in this exigent?' The manner is con-

ciliatory, but the substance is hard to digest. The moment is too critical for debate, and the point not vital; but it is an ominous detail, and Antony doubtless frowns a little. In the parley which immediately follows — which soon turns into a slanging match, as it must inevitably have done between characters and intentions so much at variance — Antony is by turns arrogantly confident, hotly indignant and sneeringly offensive: vengeance is within his grasp, but the fires still burn within him. There is little in him at this point of the 'masker' and 'reveller' that Cassius casts in his teeth.

Battle once joined, the outcome is what Shakespeare has led us to expect. Brutus is soldier enough to drive back the 'peevisish school-boy' Octavius, but fails to press his advantage home by co-ordinating with Cassius' troops; these in turn are surrounded and decimated by the war-wise Antony, who uses his army and his victory to better tactical purpose. The major conspirators are driven to their deaths, fighting in battle or falling on their swords, dying all like Romans. As we shall remember. What survivors there remain are mopped up and, in most cases, treated with military courtesy and Roman generosity by Antony, no man to bear a grudge towards faithful servants of a brave, if hated, enemy. This too sets up later echoes. The field cleared of live foes, it only remains for a eulogy to be said over the dead Brutus. That it should be Antony to deliver it is in many ways dramatically inevitable: he has been the principal avenger, the irreconcilable enemy, the unrelenting pursuer; the moving spirit and the

fatal hand. His too is the only figure left alive of comparable stature; Brutus may not be properly mourned by one of lesser worth. But there are other considerations. Generous tribute glorifies not only the dead hero; it honours the living speaker. Antony speaks for all noble Romans when he calls Brutus "the noblest Roman of them all". And in its frank acknowledgment that Brutus had not been motivated by anything but love for the public good, Antony is making a notable concession; one he would not have made to Brutus alive. This, to be sure, is by way of eulogy, a blend of regret, pity, admiration; and a sigh for the inevitable end of a mighty opponent. The last words uttered over Brutus, 'the elements/So mixed in him that Nature might stand up, / And say to all the world, this was a man' perhaps reflect as much the complexity of Antony as the simplicity of Brutus. For if ever a character lived in whom the elements were richly (and variously compounded, at odds with each other, Antony is he.

Once this note has been struck, Shakespeare allows a dying fall. Again it is dramatically fitting that a relatively minor figure should round off the play; but it is peculiarly interesting that Octavius should end *this* play. He endorses Antony's judgment of Brutus, arranges for his honourable interment, and orders the victorious army to stand down. He, not Antony, is indefinably felt to be the commander-in-chief. His is the name, his most properly the cause of the dead Caesar: the troops fight under that name as under a banner. True.

without the leadership, practical and moral, of Antony, they are nothing. Once victory has been gained, however, Antony — it might be thought — has served his purpose, and the sway of the world is once more Caesar's. In fact, even to suggest this at this stage is to exaggerate grossly: the immediate prospect is fair, all promises well; there are 'the glories of this happy day' to be shared out among the triumvirs — no less than the Roman World, and the riches thereof. Nevertheless, the seeds of dissension are there, sown in the very soil of triumph; and dimly, as it were far off, a pattern of events can be made out which bodes little good for Antony. Octavius has the last word in this play; he will have the last word in the later play too, in dismally similar circumstances. But then, the great fallen adversary, regretfully admired and all but grudgingly mourned, will be Antony himself.

For the present, only one figure bulks large against the twilight at

Philippi, though there is in him a diversity of personalities: the unappeasable avenger who has somehow become the ruthless power-seeker; the cynical realist who is also the chivalrous victor; the passionate friend who for a time has played the cool opportunist; finally, the amiable *debauché* who is now one of the masters of the world. Not wholly admirable in his qualities, nor entirely steadfast in his virtues; guilty of rabble-rousing, incitement to civil riot, mayhem and murder on one occasion, damnable as a conscienceless dealer in human lives on another; and, the crisis past, liable to backslide to his self-indulgent self. But, take him for all in all, in the austere context of *Julius Caesar*, as much of a heroic figure as the dusk of disillusion will permit. The greater Antony is to come.

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# CALCULUS — A POWERFUL MATHEMATICAL TOOL

**Robert Galea**

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A basic understanding of physics, and science in general, is necessary to lead a well-informed life. Most of us see the need for physics: it gives a basic background both for the physical sciences and the biological sciences. There are many topics in the life sciences which require a background knowledge of physics for a proper understanding, for example photosynthesis, osmosis, pigments or X-rays. To be able to formulate the laws governing natural phenomena we need an unambiguous language — Mathematics.

Man has always been fascinated by the wealth of nature around him, and intrigued by the complexity of the heavens. His never-ending study of the universe has led him to improve techniques and open up new fields of study. Until the seventeenth century the predominant school of thought laid down the foundations for a static and immutable universe. This theory did not explain exactly the facts, collected over the centuries, which advocated the idea of a dynamic and developing world. This necessitated a review of the mathematics available at the time, to enable it to deal with problems of change and growth. The chief credit for the development of such a powerful mathematical tool — the Calculus — is due to Sir Isaac Newton and Baron von Leibniz, two of the scientists who were working on the same problem, and who independently and simultaneously

contributed to the solution.

Calculus — Latin for *pebble*, since calculating two thousand years ago was largely a matter of counting pebbles) — was invented in the first place to deal with slopes of curves and the areas 'under' them. It has since proved an invaluable aid to science and engineering. The theory of calculus first appeared in England in 1687 when Newton published his *Principia Mathematica*, a 250,000 word treatise on various topics of physics and mathematics. Simultaneously with Newton's publication, Leibniz's idea of the calculus appeared on the continent. Immediately a race for priorities was initiated, with scientists in England supporting Newton's theory, and European scientists supporting Leibniz. One basic difference finally settled the issue — Newton's 'fluxion' notation in calculus was somewhat clumsy, whereas Leibniz offered the 'd' notation, a more elegant symbolism. Some fifty years later Bishop Berkeley, a philosopher, attacked differential calculus (enabling the slope of a curve at a point to be found by taking a small sector and reducing it to a point mathematically), maintaining that a point could not have a slope. This attack opened up enquiries into the logical foundations of the calculus, with Colin Maclaurin, a professor of mathematics, finding a reasonably sound basis for the calculus in 1742. Leonard Euler, Marquis de l'Hopital, and the Bernoulli brothers (Daniel

and John) further developed the calculus, with notation only slightly different from that which we use today, treating the most varied problems of differential calculus, integral calculus, and the calculus of variations. They applied it in astronomical analysis, examining the expected motions of earth, sun, moon under the mutual influence of each other's gravitational fields.

But what does 'calculus' mean to the Physics student? Quite often one gets the mechanical answer: 'dy/dx'. However for the really interested physics student, 'calculus' should imply a concurrent course dealing with the derivative and integral, and the related physical concepts of slope and area under a curve.

Perhaps the most obvious section in physics where the student comes across calculus is the 'Mechanics' part, involving the all-too-often 'rate of change'. Thus, velocity is defined as the rate of change of position with time; acceleration as the rate of change of velocity with time. Both these definitions imply limiting values, leading to the concept of the derivative. The derivative we are speaking of is interpreted as the instantaneous value of the quantity under observation, and is defined as the limit of the average value, as both elements of the average value approach zero. In the case of velocity the two elements are distance and time.

## DIFFERENTIAL EQUATIONS

Many natural laws, especially those concerned with rates of change, can be phrased as equations involving derivatives or differentials. Take for instance Newton's second law. Taken for granted, though not obvious, it took two thousand years of thinking by the most capacious minds before

it was achieved — "a uniform force produces a uniform *change* of motion". Aristotle thought that a uniform force produced a uniform motion (we can associate his term with our 'velocity'). Using our symbolism, he would have written his law as  $F = Rv$ , where R includes all resisting properties. But Aristotle did not have a concept of acceleration. For the case of a stone falling through the medium of air the time of flight would be too short for any refined observations to reveal a continuous change of velocity. His equation would apply, though, to a body falling through a very resistive medium, as this represents Stokes' law, R being the viscosity. And as soon as we handle differentials in such equations, we are then dealing with differential equations.

Differential equations are prominent in the study of various physical phenomena, such as the slipping of a belt on a pulley, radioactive decay, and the bending of a cantilever beam under the action of vertical loads. Differential equations find their way also into electricity, the most common case occurring in the simple LRC circuit. Here the current 'i' amperes and the charge 'q' coulombs for a capacitance C are related by:  $i = dq/dt$ ; the voltage drop across a coil of inductance L henries is  $L (di/dt)$ .

Substituting these quantities into an equation for the total voltage drop gives a linear differential equation (a linear differential equation of the first order implies that the dependent variable y, and its derivative with respect to x, dy/dx, occur in the first degree).

Of the two types of differential equations — 'ordinary' and 'partial' — partial differential equations tend to be more complex. (O.D.E.'s involve only one variable and derivatives with respect to it; P.D.E.'s deal with more

than one independent variable). The two partial differential equations that one comes across most often in physics are the wave equation and the heat conduction equation.

Most general one-dimensional wave motion with velocity 'a' obeys the equation

$$\frac{\partial^2 y}{\partial t^2} = a^2 \frac{\partial^2 y}{\partial x^2}$$

This partial differential equation applies to the vertical vibrations of a flexible, elastic string stretched between two supports on the x-axis. By analogy to the 'standing-wave equation', the motion can be regarded as a superposition of two waves moving with velocity 'a' in opposite direction. As a result the free vibrations are periodic, no matter what the initial conditions may be. Since periodic vibration is associated with musical effects, perhaps one can realise the importance of this fact in the development of musical instruments. Deviating from ideal conditions as encountered above, namely, free vibrations with constant amplitude, one can then consider damped oscillation of the string vibrating in air, or perhaps forced oscillations, in which the force function is independent of the vertical displacement (for instance, the gravitational force on a horizontal vibrating string).

Suppose it is required to find the distribution of temperature in an infinite rod at an arbitrary moment. If the x-axis is directed along the rod, then the temperature T at a point x of the rod at moment t satisfies the HEAT CONDUCTIVITY EQUATION

$$\frac{\partial T}{\partial t} = a^2 \frac{\partial^2 T}{\partial x^2}$$

where 'a' is a characteristic of the rod. This equation assumes that the

initial temperature is a prescribed function of the distance 'x', and that the ends of the bar have the temperature zero. If an insulated rod of length l has one end maintained at temperature zero while the other end radiates into a medium of temperature zero, then this agrees with Newton's law of cooling. If, on the other hand, the ends of the bar are insulated, then the rate of flow across the ends (but not the temperature itself) is zero, which is an essentially different problem.

An extension of the above problem leads to the three-dimensional form of the equation (in Cartesian coordinates) for the flow of substance, such as heat and water, and known as the Laplace Equation of Continuity:

$$\frac{\partial^2 T}{\partial x^2} + \frac{\partial^2 T}{\partial y^2} + \frac{\partial^2 T}{\partial z^2} = 0$$

This assumes that there are no sources or sinks within the region occupied by the fluid, and that the flow of heat is steady, so that T is independent of t. The temperature at an arbitrary point (x, y, z) of the body at moment t is represented by T. The same equation arises also in electrostatics and gravitation, since the mathematical structures of Newton's and Coulomb's laws are identical. Thus there is an equilibrium distribution of electric charge over the surface of a conductor, a stationary fluid flow in a closed region, and the like.

The student will, however, come across simpler differential equations, such as Newton's second law, simple harmonic motion, and the catenary (the equation for a flexible chain in equilibrium under gravity).

More important is the fact that such results indicate a certain parallelism between various physical phenomena.

Thus, for instance, all oscillations whether mechanical or electromagnetic, are described by the same basic mathematical equations. The three obvious types of vibration consist of free vibration, vibration with viscous damping, and forced vibration leading to resonance. The analogue of a freely vibrating mechanical system is a closed LC circuit wherein a capacitance  $C$  discharges through an inductance  $L$ , the latter assumed to be of negligible resistance. The resistance is the direct equivalent of damping effects. In the case of viscous damping, the electrical parallel is just an LCR circuit, this time  $C$  discharging through  $L$  whose resistance  $R$  is not negligible.

At the other extreme, if  $C$  is placed in series with a source of electromotive force and allowed to discharge through a coil containing  $L$  and  $R$ , resonance occurs, which is exactly identical to resonance in mechanical systems.

No matter how simple derivatives and differential equations might be, for anything of value to be extracted in the form of results one has to go through the reverse process of differentiation: integration.

Thus, whereas velocity and acceleration led to the concept of the derivative, work leads to the concept of the integral. Defined as the product of force and distance, an estimate of the work done can be obtained from a 'force-displacement', graph

simply by finding the area enclosed between the curve and the displacement axis. (A formal derivation of the integral using summations and limits is too detailed to go into at this stage, and as such the student is referred to any relevant publication regarding the subject.)

The mechanics section will call to mind such applications of the integral calculus as areas, volumes, centre of mass, centre of gravity, and moments of inertia, whereas in the electricity section, to quote one instance, one comes across Ampere's law, giving the relation between the current ' $i$ ' and the magnetic field ' $B$ ' using integral notation.

"In the space of almost precisely one century infinitesimal calculus or, as we now call it in English, The Calculus, the calculating tool par excellence, had been forged; and nearly three centuries of constant use have not completely dulled this incomparable instrument." Some of the more common applications of this 'instrument', so adequately described by N. Bourbaki, have been touched upon in this article with the hope that some of the results previously 'believed' will someday be 'understood', when one knows how to handle this tool with dexterity, if not perfection.

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