MARIA GAETANA AGNESI
and her direct influence as a woman on mathematics in the eighteenth century

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Maria Gaetana Agnesi was an Italian mathematician who lived from 1718 – 1799. As a woman, she was able to establish herself as a legitimate mathematician. Her book *Analytical Institutions*, published in 1748, was translated into English by Rev. John Colson in 1801 and was one of the first textbooks covering what we call calculus today. Using Colson's translation of Agnesi's work, we will better understand the time period and its perspective on women in mathematics. Furthermore, we will explicate a problem from Volume II of her book, and develop a better appreciation of mathematics from the time period of the 1700 - 1800s. Lastly, we will consider Agnesi's life work and how it influenced mathematics for generations to come.

The book *Analytical Institutions* was originally written in Italian, by Donna Maria Gaetana Agnesi in the year 1748 [1, p. 9]. She was the first woman to be appointed a professor at any university during that time [2] and taught mathematics and philosophy at the University of Bologna, where her influence would become well known [1, p. 9]. Rev. John Colson would be the first to translate her Italian work into the English language [2]. From volume I, p. v, English version, the Advertisement by The Editor begins:

> The *Analytical Institutions* of the very learned Italian Lady, Maria Gaetana Agnesi, Professor of the Mathematicks and Philosophy in the University of Bologna, which were published in two Volumes, Quarto, in the year 1748, are well known and justly valued on the Continent, and there cannot perhaps be a better recommendation of them in this Island, than that they were translated into English by that eminent judge of Mathematical Learning, the late Reverend *John Colson*... [1, p. 9]

Note that this 1801 English translation from Colson came fifty-three years after Agnesi wrote her book. Editor John Hellins says,

> The Analytical Institutions of Agnesi are so excellent, that he (Colson) was at the pains of learning the Italian Language, at an advanced age, for the sole purpose of translating that work into English; that the British youth might have the benefit of it as the youth of Italy. [1, p. 9]

This shows Colson's deep admiration for Agnesi's work and his dedication to mathematics. Colson writes,

> That these *Institutions*, considering the great quantity of valuable matter contained in them the judicious manner in which it is arranged, and the perspicuity with which it is explained, will be esteemed, by all candid judges, as the most valuable work of the kind that has appeared in our language, need not be doubted. [1, p. 9]

Although Colson shows great respect for Agnesi's work, the way in which he refers to her as a "lady" could be subject for interpretation today.

> The wonderful sagacity which appears... and the singular circumstance that so large a work of this kind was performed by a Lady, raised in me a wish to obtain a particular account of the Author... this *Phaenomenon* of Literature from the University of *Bologna*, of which she was once so bright an ornament. [1, p. 11]

The fact that Agnesi was female could be the very reason why Colson was intrigued by her teachings, even though his attention arose only after *Analytical Institutions* had been around over fifty years. Unfortunately, Colson passed away before his translation could be published, but Hellins carried through its publication.

The author's preface to the reader gives us a look into the mindset of Agnesi and her approach to writing a book on mathematics in her time period. She starts off by saying, "There are few so unacquainted with Mathematical Learning, but are sensible the Study of Analyticks is very necessary" [1, p. 25]. She further tells us why she wrote her book, and reveals her humility:

> But though what relates to the subject of Analyticks may have already been treated of, and is to be found in print; yet as these pieces are scattered and dispersed in the works of various authors... so that it is impossible for a beginner to methodize the several parts... to save students the trouble of seeking for these improvements, and newly-invented methods, in their several authors, I was persuaded that a new Digest of Analytical Principles might be useful and acceptable... It was never my design to court applause, being satisfied with having indulged myself in a real and innocent pleasure; and, at the same time, with having endeavoured to be useful to the Public. [1, pp. 22-24].

In Agnesi's conclusion, she shares even more of her reasons for writing:

> To conclude: As it was not my intention, at first, that the following Work should ever appear in public; a work begun and continued in the *Italian* tongue, purely for my own private amusement, or, at most, for the instruction of one of my younger Brothers, who possibly might have a taste for mathematical studies; and as I had not determined to send it abroad till after it was far advanced, and had grown to the size of a just volume; then I thought I might be excused the

> trouble of translating it into Latin, (a language which some may imagine is more suitable to works of this nature,) ... Nor could I easily overcome my natural indolence, in submitting to the drudgery of translating that into Latin which I had already composed in *Italian*. Far am I therefore from laying the least claim to any merit arising from that purity and elegance of style, ... being fully satisfied if I have always expressed myself, as I sincerely endeavoured, in a plain, but clear and intelligible manner. [1, p. 27]

Agnesi consistently kept her humility throughout her life in a way that most people today probably would not understand. She was so gifted with her mathematical talents, that when her book *Analytical Institutions* was published, the Empress Maria Theresa of Austria presented her a diamond ring in a diamond encrusted crystal case. A congratulatory letter was also sent to her from Pope Benedict XIV with a wreath made of gold and a gold medal. He also made her a professor of mathematics at the University of Bologna in 1750 [5, p. 2]. Yet, Maria was known not only for her mathematical works but also through her charity and work for the poor. After her father's death in 1752, she turned to religious studies and charitable work. Her dedication to her faith and studies allowed her to lead a life of helping others. She sold all her earthly possessions, including the gifts from the Pope and Empress, and all her inheritance in order to help those in need [3]. She truly encompassed what it means to be completely selfless.

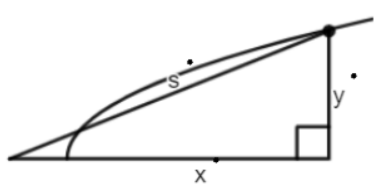
Analytical Institutions is a two-volume book consisting of over 1000 pages and 59 images of different mathematical figures. The first volume consists mostly of finite quantities (algebra) and analysis, and in the second volume she goes into the limits of calculus and touches on differential equations. Her main idea was to enable students to handle problem solving through calculations.

We will now take a closer look at her Section IV Problem I on pages 331 - 333 in Volume II of *Analytical Institutions*. We will see that Maria has a dense approach to mathematical presentation in comparison to how we see mathematics today. She omits many steps. Note that in this English translation, Newton's notation for calculus was used. So, for example we will see $\dot{x}$ for $\frac{dx}{dt}$ and so on. (In the Italian original, she wrote instead *dx* for $\dot{x}$.) The radius of the circle tangent to a curve at *E* is called the "radius of curvature at *E*." So, when a curve is given as a function, there is a corresponding radius of curvature function, which Agnesi will explore below. This material is commonly covered in Calculus III. Also, I have changed each eighteenth century English "long s" into a standard "s." All illustrations and comments in [square brackets] are mine.[1]

Problem I

62. The radius of curvature being given, any how expressed by the ordinate of a curve, to find the curve itself.

As, when the curve is given, to find its radius of curvature, it is called the Direct Method, or Problem of the Radii of Curvature, of which we have treated already; so, when the radius of curvature is given, to find what curve it is to which it belongs, is called the Inverse Problem of the Radii of Curvature. Wherefore, let the radius of curvature be = r, and be any how given by y [meaning $r = r(y)$], the ordinate of the curve ; and we may take any one of the formulae for the radii of curvature, which we please; but, first, [we consider such a formula only] for the curves referred to a *focus* ; as, for example, $\frac{y\dot{s}^3}{\dot{x}\dot{s}\dot{s}-y\dot{x}\ddot{y}}$, in which $\dot{x}\left[\frac{dx}{dt}\right]$ is constant, and $\dot{s}\left[\frac{ds}{dt}\right]$ is the element [arc] of the curve



1 Editor's Note: To maintain both readability and the visual integrity of the mathematics and analysis, this section will be presented as a visual reproducation of the original essay.

[Version One]. Then we shall have the equation $r = \frac{y\dot{s}^3}{\dot{x}\dot{s}\ddot{s}-\dot{y}\dot{x}\ddot{y}}$; or else, it being

$\dot{s}\ddot{s} = \dot{x}\ddot{x} + \dot{y}\ddot{y}$, it is $\dot{s}\ddot{s} = \dot{y}\ddot{y}$, because of $\dot{x}$ constant

$$[\dot{s}^2 = \dot{x}^2 + \dot{y}^2$$

$$\frac{d}{dt}\left(\dot{s}^2\right) = \frac{d}{dt}\left(\dot{x}^2\right) + \frac{d}{dt}\left(\dot{y}^2\right)$$

$$2\dot{s}\ddot{s} = 2\dot{x}\ddot{x} + 2\dot{y}\ddot{y}$$

Since $\dot{x}$ is constant, then $\frac{d}{dt}\left(\dot{x}\right) = \ddot{x} = 0.$

So, $\dot{s}\ddot{s} = \dot{y}\ddot{y}$.

Note for later use that then $\ddot{s} = \frac{\dot{y}\ddot{y}}{\dot{s}}$.]

and $r = \frac{y\dot{y}\dot{s}^2}{\dot{x}\dot{y}\dot{s}-y\dot{x}\ddot{s}}$.

$$[r = \frac{y\dot{s}^3}{\dot{x}\dot{s}\ddot{s}-\dot{y}\dot{x}\ddot{y}} \bullet \frac{\frac{\dot{y}}{\dot{s}}}{\frac{\dot{y}}{\dot{s}}}$$

$$= \frac{y\dot{y}\dot{s}^2}{\dot{x}\dot{y}\dot{s} - y\dot{x}\left(\frac{\dot{y}\ddot{y}}{\dot{s}}\right)}$$

$$= \frac{y\dot{y}\dot{s}^2}{\dot{x}\dot{y}\dot{s} - y\dot{x}\ddot{s}} .]$$

To reduce this equation, I make use of the method of § 49; and therefore, I make $\dot{s} = p\dot{x}$, whence

$\ddot{s} = \dot{p}\dot{x}$.

$$[\dot{s} = p\dot{x}$$

$$\frac{d}{dt}\left(\dot{s}\right) = \frac{d}{dt}\left(p\dot{x}\right)$$

$$\ddot{s} = p\ddot{x} + \dot{p}\dot{x}$$

and since $\ddot{x} = 0$,

$$\ddot{s} = \dot{p}\dot{x}.]$$

Then, making the substitutions in the equation, it will be $r = \frac{ppy\dot{y}}{p\dot{y}-y\dot{p}}$, or else $\frac{p\dot{y}-y\dot{p}}{pp} = \frac{y\dot{y}}{r}$

$[r = \frac{y\dot{y}\dot{s}^2}{\dot{x}\dot{y}\dot{s}-y\dot{x}\ddot{s}} = \frac{y\dot{y}(p\dot{x})^2}{\dot{x}\dot{y}(p\dot{x})-y\dot{x}(\dot{p}\dot{x})} = \frac{p^2y\dot{y}}{p\dot{y}-y\dot{p}}$ so, $\frac{1}{r} = \frac{p\dot{y}-y\dot{p}}{p^2y\dot{y}}$, thus $\frac{y\dot{y}}{r} = \frac{p\dot{y}-y\dot{p}}{p^2}$.] ;

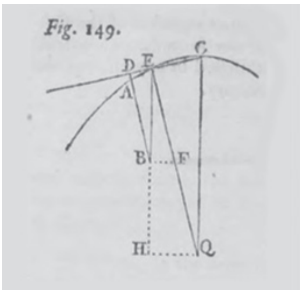
and then, by integration, because r is given by y, it will be $\frac{y}{p} = \int\frac{y\dot{y}}{r} \pm h$. [$\int\frac{p\dot{y}-y\dot{p}}{p^2} = \int\frac{y\dot{y}}{r}$, and

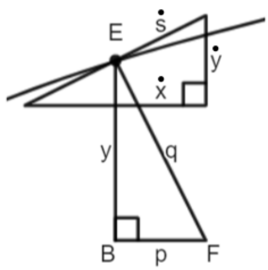
by the quotient rule on the left, $\frac{y}{p} = \int\frac{y\dot{y}}{r} \pm h$.] But $p = \frac{\dot{s}}{\dot{x}} = \frac{\sqrt{\dot{x}\dot{x}+\dot{y}\dot{y}}}{\dot{x}}$; therefore, the curve will

be

[$\frac{y}{p}$ =] $\frac{y\dot{x}}{\sqrt{\dot{x}\dot{x}+\dot{y}\dot{y}}} = \int \frac{y\dot{y}}{r} \pm h$, an equation reduced to first fluxions [first derivatives], because, r being given by y, the integral $\int \frac{y\dot{y}}{r}$ may always be had, at least transcendentally.

[Version Two] Another way. I write the equation, $r = \frac{y\dot{s}^3}{\dot{x}\dot{s}^2 - y\dot{x}\ddot{y}}$, in this manner, $\frac{y\dot{s}^3}{r} = \dot{x}\dot{s}^2 - y\dot{x}\ddot{y}$. Then, from the point B, (Fig. 149) from whence proceed the ordinates BE [y values] of the curve required AEC, I draw BF perpendicular to EB, terminated at the radius of curvature EQ;





and, making BF = p [subnormal], EF = q [normal], by the known formulae of the normal and subnormal, it will be $q = \frac{y\dot{s}}{\dot{x}}$ [or, $\dot{s} = \frac{q\dot{x}}{y}$], $p = \frac{y\dot{y}}{\dot{x}}$ [or, $\dot{x} = \frac{y\dot{y}}{p}$], or $\dot{y} = \frac{p\dot{x}}{y}$.

[By similar triangles, $\frac{q}{\dot{s}} = \frac{y}{\dot{x}}$

$$q = \frac{y\dot{s}}{\dot{x}}, \text{ and}$$

$$\frac{p}{\dot{y}} = \frac{y}{\dot{x}}$$

$$p = \frac{y\dot{y}}{\dot{x}}$$

meaning $\dot{y} = \frac{p\dot{x}}{y}$.]

And, by taking the fluxions, on the supposition of $\dot{x}$ being constant, it will be $\ddot{y} = \frac{y\dot{p}\dot{x} - p\dot{x}\dot{y}}{yy}$

$$[\,\dot{y} = \frac{p\dot{x}}{y}$$

$$\frac{d}{dt}(\dot{y}) = \frac{d}{dt}\left(\frac{p\dot{x}}{y}\right)$$

$$\ddot{y} = \frac{y\frac{d}{dt}(p\dot{x}) - p\dot{x}\left(\frac{dy}{dt}\right)}{y^2}.$$

$$= \frac{y(p\ddot{x} + \dot{p}\dot{x}) - p\dot{x}\dot{y}}{y^2}$$

and since $\ddot{x} = 0$,

$$\ddot{y} = \frac{y\dot{p}\dot{x} - p\dot{x}\dot{y}}{y^2}. \,]$$

And, making the substitutions in the principal equation [which was $\frac{y\dot{s}^3}{r} = \dot{x}\dot{s}^2 - y\dot{x}\ddot{y}$], it will be

$\frac{y\dot{s}^3}{r} = \dot{x}\dot{s}^2 - \dot{p}\dot{x}^2 + \frac{p\dot{x}^2\dot{y}}{y}$. [$\frac{y\dot{s}^2}{r} = \dot{x}\dot{s}^2 - y\dot{x}\left(\frac{y\dot{p}\dot{x} - p\dot{x}\dot{y}}{y^2}\right) = \dot{x}\dot{s}^2 - \dot{p}\dot{x}^2 + \frac{p\dot{x}^2\dot{y}}{y}$.]

But $\dot{s} = \frac{q\dot{x}}{y}$; therefore $\frac{q^3\dot{x}}{r} = qq\dot{x} - yy\dot{p} + py\dot{y}$.

[$\frac{y\dot{s}^3}{r} = \dot{x}\dot{s}^2 - \dot{p}\dot{x}^2 + \frac{p\dot{x}^2\dot{y}}{y}$ and substituting $\dot{s} = \frac{q\dot{x}}{y}$, we have

$$\frac{y}{r}\left(\frac{q\dot{x}}{y}\right)^3 = \dot{x}\left(\frac{q\dot{x}}{y}\right)^2 - \dot{p}\dot{x}^2 + \frac{p\dot{x}^2\dot{y}}{y}$$

$$\frac{q^3\dot{x}^3}{y^2 r} = \frac{q^2\dot{x}^3}{y^2} - \dot{p}\dot{x}^2 + \frac{\dot{p}\dot{x}^2\dot{y}}{y}.$$

Multiply by $\frac{y^2}{\dot{x}^2}$ to get

$$\frac{q^3\dot{x}}{r} = q^2\dot{x} - y^2\dot{p} + py\dot{y}.]$$

And, because it is $\dot{x} = \frac{y\dot{y}}{p}$, it will be $\frac{q^3\dot{y}}{r} = qq\dot{y} + pp\dot{y} - yp\dot{p}$

$$[\frac{q^3\dot{x}}{r} = q^2\dot{x} - y^2\dot{p} + py\dot{y}$$

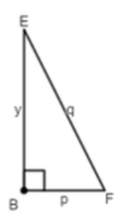
and substituting $\dot{x} = \frac{y\dot{y}}{p}$, we have

$$\frac{q^3}{r}\left(\frac{y\dot{y}}{p}\right) = q^2\left(\frac{y\dot{y}}{p}\right) - y^2\dot{p} + py\dot{y}.$$

Multiply by $\frac{p}{y}$ to get

$$\frac{q^3\dot{y}}{\Gamma} = q^2\dot{y} + p^2\dot{y} - yp\dot{p}.]$$

But, because of the right angle EBF, [by the Pythagorean Theorem]



it is $pp = qq - yy$, and $p\dot{p} = q\dot{q} - y\dot{y}$.

$$[p^2 = q^2 - y^2$$

$$\frac{d}{dt}(p^2) = \frac{d}{dt}(q^2) - \frac{d}{dt}(y^2)$$

$$2p\dot{p} = 2q\dot{q} - 2y\dot{y}$$

$$p\dot{p} = q\dot{q} - y\dot{y}.]$$

Wherefore, making the substitution, we shall have $\frac{qq\dot{y}}{r} = 2q\dot{y}\text{-}y\dot{q}$,

$$[\frac{q^3\dot{y}}{r} = q^2\dot{y} + p^2\dot{y} - yp\dot{p}$$

and substituting both $p^2 = q^2 - y^2$ and $p\dot{p} = q\dot{q} - y\dot{y}$

$$\frac{q^3\dot{y}}{r} = q^2\dot{y} + (q^2 - y^2)\,\dot{y} - y(q\dot{q} - y\dot{y})$$

$$= q^2\dot{y} + q^2\dot{y} - y^2\dot{y} - yq\dot{q} - y^2\dot{y}$$

$$= 2q^2\dot{y} - yq\dot{q}.$$

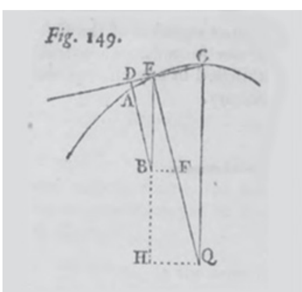
Divide by q,

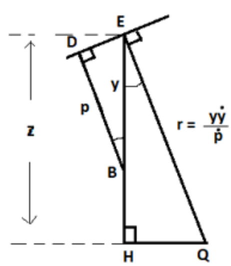
$$\frac{q^2\dot{y}}{r} = 2q^2\dot{y} - y\dot{q}.\ ]$$

and, multiplying by y, and dividing by qq, it will be $\frac{y\dot{y}}{r} = \frac{2qy\dot{y} - yy\dot{q}}{qq}$; by integration, it is $\int \frac{y\dot{y}}{r} \pm h = \frac{yy}{q}$. [since $\int \frac{2qy\dot{y} - y^2\dot{q}}{q^2} = \frac{y^2}{q}$ by the quotient rule.] But $q = \frac{y\dot{s}}{\dot{x}}$; therefore $\int \frac{y\dot{y}}{r} \pm h = \frac{y\dot{x}}{\sqrt{\dot{x}\dot{x} + \dot{y}\dot{y}}}$.

[recalling $\dot{s} = \sqrt{\dot{x}^2 + \dot{y}^2}$.]

[Version Three] It may be done thus more simply, by avoiding second fluxions. Taking the infinitely little arch EC, let the chord CED be produced, to which let BD be perpendicular.





Now, if we make BD = p, by what has been said at § 115, Sect. V, B. II, QE = [radius of curvature] $r = \frac{y\dot{y}}{\dot{p}}$, and therefore $\frac{y\dot{y}}{r} = \dot{p}$; and by integration, because r is given by y, it is $\int \frac{y\dot{y}}{r} \pm h\ [= p] = \frac{y\dot{x}}{\sqrt{\dot{x}\dot{x}+\dot{y}\dot{y}}}$; for $p = \frac{y\dot{x}}{\sqrt{\dot{x}\dot{x}+\dot{y}\dot{y}}}$,

by the place now quoted.

Let it be $r = \frac{y}{b}\sqrt{aa + bb}$; then it will be $\int \frac{b\dot{y}}{\sqrt{aa+bb}} \pm h = \frac{y\dot{x}}{\sqrt{\dot{x}\dot{x}+\dot{y}\dot{y}}}$,

and by actual integration, (omitting the constant h [of integration] for greater simplicity,) [and then dividing both sides by y] $\frac{b}{\sqrt{aa+bb}} = \frac{\dot{x}}{\sqrt{\dot{x}\dot{x}+\dot{y}\dot{y}}}$, and therefore $b^2\dot{x}^2 + b^2\dot{y}^2 = a^2\dot{x}^2 + b^2\dot{x}^2$,

that is,

$b\dot{y} = a\dot{x}$

$$[\ \frac{b}{\sqrt{a^2+b^2}} = \frac{\dot{x}}{\sqrt{\dot{x}^2+\dot{y}^2}}$$

$$b\sqrt{\dot{x}^2 + \dot{y}^2} = \dot{x}\sqrt{a^2 + b^2}$$

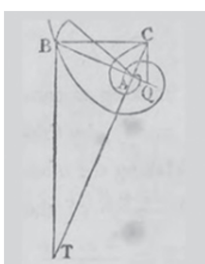
and squaring both sides,

$$b^2\dot{x}^2 + b^2\dot{y}^2 = a^2\dot{x}^2 + b^2\dot{x}^2$$

$$b^2\dot{y}^2 = a^2\dot{x}^2$$

$$b\dot{y} = a\dot{x}.\ ]$$

which is the logarithmic spiral of example V, § 128, Book II.



[Version Four] Instead of the radius QE let the co-radius HE = z be any how given by the ordinate y [$z = z(y)$]. Because of similar triangles, EBD, QEH, it will be EB. BD :: QE. EH; that is [recalling that in Version Three BD = p and QE = $r = \frac{y\dot{y}}{\dot{p}}$], y. p: $\frac{y\dot{y}}{\dot{p}}$. z, and therefore $z = \frac{p\dot{y}}{\dot{p}}$, or $\frac{\dot{y}}{z} = \frac{\dot{p}}{p}$;

$$[\frac{EB}{BD} = \frac{QE}{EH}$$

$$\frac{y}{p} = \frac{\frac{y\dot{y}}{\dot{p}}}{z}$$

$$z = \frac{p\dot{y}}{\dot{p}}.]$$

and by integration, $\int \frac{\dot{y}}{z} \pm h = lp$ [$\log p$]. Make $z = y$, then $\int \frac{\dot{y}}{y} \pm h = \int \frac{\dot{p}}{p}$; and by integrating, $l\, y = l\, p + l\, \frac{m}{h}$, that is, $y = \frac{pm}{h}$.

$$[\ \log y = \log p + \log\left(\frac{m}{h}\right)$$

$$= \log\left(\frac{pm}{h}\right),$$

$$\text{so } y = \frac{pm}{h},$$

Note that $\log\left(\frac{m}{h}\right)$ is the joint constant of integration written with an arbitrary constant m.]

But [from Version Three] $p = \frac{y\dot{x}}{\sqrt{\dot{x}\dot{x}+\dot{y}\dot{y}}}$, then $h\sqrt{\dot{x}\dot{x} + \dot{y}\dot{y}} = m\dot{x}$, and therefore $h\dot{y} = \dot{x}\sqrt{mm - hh}$

,

$$[\ h\sqrt{\dot{x}^2 + \dot{y}^2} = m\dot{x}$$

Squaring both sides,

$$h^2\left(\dot{x}^2 + \dot{y}^2\right) = m^2\dot{x}^2$$

$$h^2\dot{x}^2 + h^2\dot{y}^2 = m^2\dot{x}^2$$

$$h^2\dot{y}^2 = \dot{x}^2(m^2 - h^2)$$

$$h\dot{y} = \dot{x}\sqrt{m^2 - h^2}.]$$

which is the logarithmic spiral; and, when h [constant of integration] = b, $m = \sqrt{aa + bb}$ is the same as the above-cited.

From Problem I we can see how drastically different the presentation of Calculus was in 1748, and reflected in the 1801 English translation, compared to how we approach it now, and how many calculations were omitted from Agnesi's presentation.

Maria Agnesi and her work in *Analytical Institutions* formed a strong argument supporting women's abilities and the perception of higher mathematics written by a female author. Her book would remain one of the most valued textbooks for at least the next fifty years [5, p. 4]. Although Agnesi was recognized for her works, she still faced much adversity being a woman of that time period.

> The social status of women and, in particular the opportunities for them to enter the arts and the sciences had been widely discussed... since the famous debate at the Accademia dei Ricovrati of Padua [Italy] in 1723...The resulting publication (1728)...included the Latin oration recited by Gaetana...[which] rejected three main kinds of objection to women's study: tradition, the alleged inability of the female mind, and the social disruption that would follow from this concession. [4, p. 135]

Her written rejection regarding women and academics was made 20 years before her publication of *Analytical Institutions*. She also faced adversity from her peers in a male dominated academic setting, making her success even more amazing. Her work as a woman in the 1700s had a direct effect on generations to come. But, even twenty-five years after her book was published, there was no drastic change on the view of women and their roles in society. In his book on Agnesi's world, Mazzotti writes,

> In the 1770's, the debate on women's education reached its height with the controversy over the "thinking uterus"...

> [which] emphasized the power (*imperio*) of the body over the female mind (*animo*) and the fact that women were constantly determined by their "material machinery," particularly the uterus. Therefore, the capacity for reasoning would be "impeded, limited and confused" in women by their sexual organs. [4, p. 128]

This was an insult to women, and Agnesi's book alone should have tanked this male argument. But it would still take a long time for women to be accepted as equal in abilities to men. Maria Gaetana Agnesi was one major step ahead on that path, and she is optimistic about the future of these inequalities in her Author's Dedication to her sacred imperial majesty Maria Teresa of Austria, Empress of Germany, Queen of Hungary, Bohemia, etc., which seems a fitting end to this paper:

> Among the various arguments I revolved in my mind, inducing me to hope, that Your Sacred Majesty, according to your great condescension, would vouchsafe to receive favorably this Work of mine, ... none has encouraged me so much as the consideration of your sex, to which Your Majesty is so great an ornament, and which, by good fortune, happens to be mine also. It is this consideration chiefly that has supported me in all my labours, and made me insensible to the dangers that attended so hardy an enterprise. For, if at any time there can be an excuse for the rashness of a Woman, who ventures to aspire to the sublimities of a science, which knows no bounds, not even those of infinity itself, it certainly should be at this glorious period, in which a Woman reigns, and reigns with universal applause and admiration. [1, pp. 17-18]

Works Cited

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Questions to Consider

1. The author quotes Agnesi's discussion on her desire to create a work originating in and built upon using the Italian language. Why was that such a major thing at the time? And do you think something like that would be just as important now?
2. Though this piece discovers mathematical techniques considered by some to be complex, the essay provides an interesting look to analyzing math based on how it's constructed, not necessarily the answer it gives. In what similar ways can the work in your major or your interests be analyzed?
3. There's no doubting Agnesi's impact as a woman in the mathematics field, both in her time and since. Why is it important to recognize and continue telling the stories of pioneers in many different fields?
4. The author states that the way Colson refers to Agnesi as a "lady" is open for interpretation. What are some ways that it could be interpreted? How do you think Colson intended it? And what informs these ideas?