Semen donors who are open to contact with their offspring: issues and implications for them and their families

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Abstract This study investigates the motivations, views and experiences of semen donors willing to have contact with their offspring. An online questionnaire for semen donors was posted by the US-based Donor Sibling Registry in 2009. A total of 164 respondents who had previously been donors completed the questionnaire, which consisted of 45 open and closed questions covering motivations for donating, health and medical information, experiences of donating, contact with offspring and implications of donating and contact for their families. The donors’ primary motivation was to help other families, although payment was also a factor. Almost all donors were open to contact with their offspring and, where donors were partnered, three-quarters of the partners also supported possible contact. Almost one-third, however, had reservations about contact or were opposed. Two-thirds of donors’ own children were interested in meeting the offspring. Contact between a donor and his offspring is often seen as a coming together of these two people only. The results of this study suggest that there are important ramifications for both of the families who become linked. Understanding gamete donation in this broader family context is crucial to the contribution that health professionals can make in this area.

Introduction The culture of gamete donation has and is undergoing a revolution. The traditional practice of parents being secretive about their use of donated spermatozoa or oocytes, along with the accompanying anonymity of the donors, is being increasingly questioned. A major feature of the changing culture has been the emergence of a public policy approach to the development and management of all areas of assisted human reproduction. This has seen an increasing number of
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jurisdictions creating policy or enacting legislation which has established boundaries concerning what is acceptable and not acceptable medical and scientific practice. In a number of jurisdictions there has been legislation and policy which has addressed the anonymity of gamete donors, with a move towards offspring conceived as a result of donated gametes being able to obtain the identity of ‘their’ donor should they wish this (Blyth and Landau, 2004; Daniels, 2003). An accompanying trend of considerable significance in changing the culture has been the increasing influence of the consumer voice. This has emerged in part from the greater social acceptance of assisted reproduction in the community; however, it needs to be acknowledged that the consumer voice has also contributed to that social acceptance. The consumers are the parents who have utilized donated gametes to build their families, and in more recent times their voices have been amplified by the offspring who owe their existence to the donors and their parents. The offspring’s voices are being increasingly heard (Schieb et al., 2005; Paul and Berger, 2007; Jadva et al., 2009; Mahlstedt et al., 2010; Beeson et al., 2011).

These changes have led to considerable concern about the impact of this culture change on the willingness of gamete donors to continue to come forward. There have been frequent assertions in the UK, for example, that since the law change banning donor anonymity, there has been a growing shortage of donors (Wardle and Skew, 2008; Turkmen dag et al., 2008; Thornhill, 2009; Tomlinson et al., 2010). This is despite the most recent figures from the Human Fertilisation and Embryology Authority (HFEA) which show that both oocyte and sperm donors have increased since the legislation in 2005. There had been a decline in sperm donors from 2001 to 2004 but since then the numbers have increased each year, with 2010 seeing the largest number of new donors since records began (HFEA, 2012). A recent news report (Guy, 2011) said that as a result of a new marketing programme the London Sperm Bank recruited enough new donors to, theoretically, provide over 2000 treatment cycles, which is around half of the annual demand in the UK.

A similar pattern has occurred in Sweden, which was the first country in the world to introduce such legislation (Sweden, 1984). There were claims that no donors were coming forward and that donor insemination services would cease. Again, the figures supplied by the government body responsible for this area showed that after an initial decline, the figures increased and then exceeded the numbers prior to the legislation (Daniels and Lalos, 2005).

It could be argued that the gamete donors, like parents and offspring, are another group whose voices have not been heard, or if heard, not received a great deal of attention. It is important to hear their voices as their needs and issues have to be considered, especially as the removal of anonymity has quite dramatically changed the expectations of them. Research into the views of gamete donors has been relatively sparse. Recent review articles on oocyte donation (Daniels, 2007b; Purewal and van den Akker, 2009) and sperm donation (Daniels, 2007a) have provided an overview of the recent and current research, including donor motivation. On sperm donation, Daniels (2007a) concluded ‘this evidence shows it is possible to recruit men as semen donors when they are required to be identifiable to offspring in the future, if this is what the offspring want and what the law now requires. The evidence, while not conclusive, points to an open system attracting different kinds of men than an anonymous system’. Subsequent to the overview of semen donor research, additional research has been published (Thorn et al., 2008; Tomlinson et al., 2010; Riggs and Scholz, 2011).

At a time when there is increasing discussion and challenge of the secrecy that has surrounded gamete donation and the accompanying anonymity of donors, it is important that donors’ voices are ascertained and considered. This paper reports on the views of 164 semen donors, mostly from the USA, who responded to a web-based survey. The paper’s focus is on the motivation of the donors and their views and behaviour concerning connection with offspring and issues arising from their being a donor for their own family. This is the first study to report on the actual and potential issues arising for the donor’s family. The issue of contact between parties in donor insemination has been addressed in recent papers but from different perspectives. Scheib and Ruby (2008) interviewed people who used the same donor in having children, while Blyth (2012) interviewed eight adult offspring who had had contact with their half-siblings. In both of these studies, there is evidence of the need to acknowledge and consider the extended networks that are formed as a result of family building using donated gametes. The results from this study add the donors’ perspectives to this emerging field.

Materials and methods

An online questionnaire to collect data from sperm donors regarding the above issues was made available by the Donor Sibling Registry (DSR) over a 14-week period (from 9 October 2009 to 10 January 2010). At that time, the DSR had a total of more than 26,000 members, with less than 1000 of them identified as sperm donors.

Survey links were posted on the DSR’s website and all sperm donors registered on the DSR were invited via email to complete the survey. The invitation to participate was also posted on other sites on the web, for example, a Yahoo Group called ‘Sperm donors’, as well as other blogs and chat groups.

The online questionnaire consisted of 45 questions, both multiple choice and open ended, which gathered both quantitative and qualitative data. The survey was accessible through Survey Monkey, a web-based survey. Questions were asked about health issues, updating of medical information and subsequent contact with clinics, what donors were told on the limits of children, counselling/education received, details on donating to multiple banks, specific reasons for contacting offspring, outcomes of contact including specific challenges and rewards with making contact, whether or not donors thought about offspring, information on spouses/children/family members, reflections on having been a donor and what their advice might be to those considering donation.

This is the second study of sperm donors undertaken by the DSR. The first study, which was also undertaken via an
online survey, was available on the web between April and June 2007 and included both sperm and oocyte donors (Jadva et al., 2010). Sixty-three sperm donors took part in comparison with the 164 sperm donors in the study now being reported. At the time of the study of Jadva et al. (2010), there were 250 donors registered with DSR compared with the just-under 1000 donors at the time of the current study. The first study sought responses of donors regarding their gamete donation experiences and their experiences of contact with offspring.

This second survey was a logical extension of the first, and while it covered some of the same areas, it went into these areas in greater detail requiring donors to reflect on their experiences and impact of donation. There was also a broader focus to the second study with information being sought on the donor and his family, patterns of donating, health matters and the recruitment issues. These results, relating to the donor and his family, are the main focus of this paper.

There had been increasing public discussion in regard to sperm donation and connections between donors and offspring during the 2007–2009 period, and it was thought that many donors might now be more informed and aware of the issues involved in making contact and also that many more would have now actually made contact with their offspring. It is clear that some of the respondents completed both the first and second surveys. Because of the anonymous nature of the first survey it is not possible to quantify the numbers completing both surveys. In addition, it needs to be noted that the majority of results reported in this paper cover quite different areas than those reported in the previous study.

The DSR undertook this survey without any affiliation to a teaching or research institution and therefore had no body to apply to for ethical approval. However, data were collected in accordance with the ethical guidance set out in the International Sociological Association’s Code of Ethics (2001), which states that formal ethics committee approval does not have to be sought for this type of research (unlike clinical trials) but that the project must comply with the guidance issued in the Code. The authors confirm that that the research complied with the guidance. Consent was implied by a willingness to complete the survey and it was anonymous.

The Donor Sibling Registry (DSR) was established in 2000 and has experienced dramatic growth in its membership. At the time of this survey the membership stood at over 26,000 (now 36,000) with just less than 1000 identifying themselves as sperm donors. Members come from many different countries, with the majority being from the USA. The large number of members has provided a unique opportunity for researchers, in collaboration with the DSR, to ascertain the views of parents (Freeman et al., 2009), offspring (Beeson et al., 2011; Jadva et al., 2009; Jadva et al., 2010) and donors (Jadva et al., 2011). As a result, information is now available from these stakeholder groups in larger numbers than previously. There are clearly limitations to this type of research, however: self selected samples, in the main descriptive statistics, and lack of control groups to cite the most obvious. Gathering information, views and experiences from parents, offspring and donors has been traditionally difficult and most studies have covered relatively small numbers. This latest study provides new information which has important implications for professionals working in the field.

Results

The sample consisted of 164 men who had previously been sperm donors (Table 1). The majority of these donors (89%, n = 144) were aged between 18 and 35 at the time of donating and just over two-thirds (70%, n = 112) had donated over a period of 1–4 years. The majority of donors (76%, n = 75) who indicated in which country they were domiciled were from the USA.

Motivation for becoming a donor

Respondents were asked ‘Why did you decide to become a sperm donor?’ Three options were offered: (i) for the money; (ii) to help families who wanted children; and (iii) knowing that I might not have children, it was a way to pass on my genes. Donors were asked to choose all answers that were applicable to them. Table 1 shows that the motivation of the majority of donors (78%, n = 124) was to help families who wanted to have children, while 61% (n = 97) donated for monetary reasons and 41% (n = 66) donated to pass on their genes. This question was completed by all but four respondents.

The donor’s own family

Table 2 shows that almost three-quarters of respondents (71%, 115/161) are currently married or partnered and just over half (58%, n = 90) had children of their own. Almost all donors (91%, 116/128) had shared with their wives/partners that they have been donors and, of these, almost two-thirds (65%, 70/108) had shared this information before they became seriously involved with the partner. A number of respondents indicated the decision to donate had been a joint one with partners being very encouraging. One respondent commented that ‘at the time that I donated, my wife knew about and encouraged donation and that was part of the decision to donate’. Another respondent said his wife had ‘actually accompanied me to the sperm bank ... to help with the donations on occasions’. Almost all married or partnered donors (85%, 88/103) indicated their wives/partners were open to the donor connecting with his offspring. Fifteen out of 103 donors (15%) said their partners were not open to the donor connecting with his offspring, while a further 17/45 who added

<table>
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<th>Reason for motivation</th>
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<td>For the money</td>
<td>60.6</td>
<td>97</td>
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<tr>
<td>To help families who wanted children</td>
<td>77.5</td>
<td>124</td>
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<tr>
<td>Knowing that I might not have children, it was a</td>
<td>41.3</td>
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The question was answered by 160 respondents. More than one option could be chosen.
Of the donors who had children in their own family, just over a third (35%, 33/95) had told them while 25% (24/95) had not told. A further 40% (38/95) said that their own children were too young to be told. Of these, 85% (57/67) said that they intended to tell when the children were older. Those donors adding comments (n = 10) to their answers said that two determining factors would influence their decision to tell, the first being if it seemed appropriate (n = 6) and the other being only if a meeting with his offspring was to take place (n = 4). For a further five donors, there was uncertainty regarding the decision to share this information.

Donors who had told their own offspring were asked if the offspring were interested in meeting their half-siblings. Just over two-thirds of the offspring (70%, 23/33) were interested in meeting, while the rest were not.

### Connection with offspring

Donors were asked if they ever thought about the offspring they had helped to create. Of those answering, 97% (147/151) said they had. Open-ended responses revealed that curiosity was the predominant theme and this centred on how many children there were, their state of health and happiness and physical likeness and whether there was a physical connection or shared physical characteristic/likeliness between the donor and the offspring. One respondent commented 'I'm very curious and hopeful they are well, healthy and happy'. Another said 'I often think about who they are, are they happy and what are they doing with their lives'. And another said 'I wonder how they looked, if I would one day see a child that looks like me and ponder if they’re genetically related'. One respondent said, 'Yes I think about them and pray for them on a regular basis. They may not be my family but they are still part of me'.

Respondents were overwhelmingly (94%, 150/160) open to contact with their offspring but the type of contact showed some variation. Almost 86% (n = 137) were willing to answer any questions offspring may have, 83% (n = 132) were willing to share medical information, 80% to have email contact (n = 128) or share photos (n = 129), 78% (n = 124) having a meeting and 71% (n = 114) establishing a relationship. Almost a third (29%, n = 46) were open to establishing a parent–child relationship with the offspring, with the additional comments indicating the donors did not want to inject themselves as parents, acknowledging that the offspring already had parents. There was a strong indication in the open-ended comments that donors saw the type and frequency of possible contact as a matter initiated and controlled by the offspring and possibly their parents. At the time of the survey, 22% of donors (33/153) had made contact with their offspring, although many of the offspring were still quite young. Most donors reported feeling 'close' to the offspring, especially those they had personally met. At the same time there was acknowledgement from a number of donors that boundary setting was important and as one donor said 'I keep reminding myself that it's supposed to be about her, it's not about me'. Another donor reported that 'My kids feel familiar and comfortable to be around. I feel connected to them, but it's unlike any other relationship I have ever had'.

Donors who had been contacted by offspring (22%, n = 33) were asked what had been the most challenging
aspects of connecting with their offspring. In addition to the 33, another 20 respondents (13%) answered this question and their comments suggest that challenges had emerged in relation to anticipated contact. The major challenge cited by this group of donors was the adjustment to the relationship and issues within the donor’s own family. While most of the adjustments were associated with their partner, some related to their own children and were centred on issues of telling the children they had half-siblings as a result of their father having been a sperm donor. Relationship issues with partners is illustrated for example by this typical quote, ’Managing the relationships at home …, I learned that my wife had feelings of jealousy when I would spend time online chatting with my donor child’s mother’. Relationships with the offspring’s family also presented challenges, especially when there was some degree of secrecy being maintained in that family or where the mother was a single woman. Analysis of the open-ended responses suggests that the challenges arose from the offspring’s mother rather than the offspring. Some donors reported that there was a fear of connecting and that this was very challenging. The fears were of possible rejection or disappointing the offspring or parents. For those donors who had many offspring, the sheer number of children to meet was a daunting prospect for them. As one donor said, ‘It’s still early, as most kids are so young. I foresee the most challenging aspect being the sheer volume of potential people to connect with and maintain communications with. 60+ kids in addition to parents is daunting.’

Discussion

It has been suggested (Daniels et al., 1997; Murray and Golombok, 2000) that sperm donors who are older, married and have children in their own family are more likely to be open to contact with offspring in the future than younger unmarried men without children. It has also been found in one study that donors’ views about information sharing and possible contact can change over time, the trend being towards more openness (Daniels et al., 2005). The evidence from this study provides both support for and a challenge to these views. On the question of age, 67% of respondents were 24 or over at the time they donated. At the time of the study, however, 94% were aged 31 or over, 71% were currently married or partnered and 58% had children in their own family. While age and marital status mirror the demographics in the studies cited in the overviews by Daniels 2007b, Purewai van de Akker 2009 and Daniels 2007a, the number with children of their own does not. It might be speculated that the older men in the current study without children of their own (42%) could be particularly interested in obtaining information about ‘their’ donor insemination offspring as well as potentially meeting with them. The offspring may represent to them the children they wished they had had and perhaps had been able to parent. This possibility is reinforced by the fact that 41% of respondents said part of the motivation for donating was that they believed they might not have children of their own and because of this donating spermatozoa was seen as a ‘way to pass along my genes’.

It could be expected that most donors who had joined the DSR (73%) would have done so because they were in agreement with the major objectives of the organization, most notably to make contact with or be available to offspring. This means that respondents who were members of DSR in the study already had an interest in and commitment to openness regarding donor insemination. The reason cited by most respondents (78%) for donating was to help families who wanted children and this generally is in line with the reasons given by donors in the six studies cited in the review by Daniels (2007a). For 61%, money was a motivating factor for becoming a donor. Again there is evidence that for older donors, payment is not the issue that it is for younger men (Murray and Golombok, 2000). The issue of payment for gamete donation is currently being reviewed by the HFEA in the UK by way of a public consultation; there is currently no payment. It will be interesting to see how the tension between what could be described as the ‘political’ issues surrounding increasing the supply of donors by offering payment as an incentive can be reconciled with the ethical issues associated with the ‘rightness’ of paying for human gametes and to what extent the research evidence available on donor motivation will play a part in the decision making. The results of this study, along with the other studies of donor motivation, for example Thorn et al. (2008), Tomlinson et al. (2010) and Riggs and Scholz (2011), suggest that reasons for donating are varied, that there are often multiple reasons for donating and that demographics such as age, marital status and children of their own impact on motivation.

There has been a tendency in the studies of donors (Daniels, 2007a) to focus on the donor as if he were an individual making a personal choice/action and that this impacted on him alone. Donations are much more than a simple transaction with a sperm bank. Donor’s actions today can have an immeasurable effect on not only their future but potentially the futures of many other lives, including their partners/wives and their own children and parents, as well as the offspring they help to create. The growing number of offspring who now know of their family building origins and wish to have information and/or contact with the donor has challenged the way in which donors are viewed. No longer can he/she be seen as an individual alone. Beyond the donor and the offspring, there are considerations and impacts for their two families and networks (Daniels, 1991). In the current study, information was sought from donors as to the impact of their donating, and particularly their willingness to pass on information and have contact with offspring, on their partners and children.

With 71% of respondents being married or partnered, these donors are part of a set of relationships which will be impacted by the donor’s decision to make himself available for information sharing and/or contact, especially given that over 90% of these respondents had told their partner of their having been a donor. A very high proportion (85%) of these respondents said their partners were supportive of their decision to be open to offspring. This figure would seem to be related to two-thirds of this group having been open with their donating history before the partnership had become serious and formalized. In other words, the donating was not a secret which was revealed after long-term commitments had been entered into. For a number of respondents who were partnered at the time they
donated, they indicated the decision had been a joint one and it would seem appropriate that when a donor is partnered then the decision making to become a donor should include both partners.

It needs to be noted, however, that the decision to be open to communicate/meet with offspring is not always supported by partners, with 32% being opposed or having reservations, believing that this was an area which was or could become problematic. It would seem that those who are working with donors in relation to potential or actual contact with offspring need to assist them to explore the implications of their decision making for their own families. Further, the fact that 12 donors (10%) did not know what their wives/partners felt about contact or possible contact is a concern in that it suggests that communication about this issue is limited or non-existent. The study design and results do not allow us to gain any insights into reasons for this.

The donor’s own children are also likely to have thoughts and feelings regarding their father having been a donor and the fact that they have half-siblings with whom they may have contact. To date, little attention has been devoted to this interested or potentially interested party. With 72% of donors with children having told, or intending to tell when the children were older, this means that there was a high commitment on the part of donors to openness with their own children. As far as is known, there is no literature which discusses or advises on an appropriate age for the donor’s own children to be told. With just over a third of donors having told their own children, this means that approximately two-thirds of the respondents had been or will be open with their own children.

The donor’s own children are therefore a potential or actual party to their father’s actions, being part of the network of relationships. In the present study, of the two thirds of the offspring who knew their father had been a donor, 70% were interested in meeting with their half-siblings as an indication that this is an evolving area about which there is little information at present.

When questioned whether they thought about their offspring, 97% of respondents indicated that they think about the offspring they have helped to create, suggesting that they do not see the act of donation as a one-off event, as a transaction that has been completed when the semen sample is provided. The main factor cited by donors in relation to their thoughts about the offspring was curiosity about them and in particular about their health and happiness, but there was also a focus on the possibility of the physical characteristics and likeness of the donor being mirrored in the offspring. One respondent commented, ‘Often I wonder what my donor children are doing with their lives, what they look like and to what extent they have some of my unusual … characteristics’. These views are mirrored in a study that explores the views of the offspring about their donors. Jadva et al. (2010) found that curiosity about the donor’s looks was a major reason for seeking contact. Other reasons cited by offspring included gaining access to their ancestry and medical history.

Donors in this study do seem to feel a bond exists between them and their offspring, most donors reporting feeling ‘close’ to the offspring, especially those they had personally met. The donor who said ‘They may not be my family but they are still part of me’ seems to illustrate this bond in a powerful way. Because of the assumed and common practice of thinking of children as a part of the parent’s family, gamete donors (and indeed everyone) are challenged to find a new way of explaining the nature of the connection/bond. Grace et al. (2007) and Kirkman (2003) have discussed the significance of the biological connection between offspring and donors, highlighting its importance. How all the involved parties understand and make sense of this bond is likely to impact on the nature and quality of any connections which are established.

Almost all respondents (94%) were open to contact with offspring, with 85% being open to meeting them and 78% establishing a relationship with the offspring. These figures are very high and almost certainly reflect the strong interest in a commitment to openness of the donors who chose to take part in this online survey.

The DSR has now facilitated connections between almost 600 donors and their offspring in the USA, Canada and Germany, and in other countries professionals report that they are facilitating increasing numbers of connections. Little has been written about the management of such connections and it is clearly an area which needs careful consideration.

Research into the contact experiences is essential to provide a basis for enhancing policy and practice. Almost a third (32%) of respondents indicated they were open to establishing a relationship with their offspring. While this can be understood in terms of a lack of alternative ways of explaining the possible relationship, it needs to be noted that these are important differences to what is traditionally thought of as a parent–child relationship. The relationship will be based on a biological tie only, the donor not having been involved in the nurturing aspects of parenting. Also, any meeting may well be taking place between two adults, rather than adult and a child. Factors such as this need to be considered as attempts are made to understand, describe and prepare for the development of such relationships. This is largely ‘unknown territory’ as far as the academic and professional literature is concerned.

Respondents willing and keen to establish relationships with their offspring were mindful of not interfering with the established parent–child relationship of which the offspring was a part. They also expressed a desire to be responsive to the offspring’s needs, rather than seeking to meet their own needs. The underlying theme seemed, therefore, to be one in which donors saw themselves as being responsive and responsible to the needs of the offspring.

The notion of boundaries and boundary setting is a fundamental component of relationships. The boundaries may be overt or covert, but in most established relationships they are understood and acknowledged. In this evolving field, the boundaries are not clear and this is reflected in the donors who had made contact with their offspring reporting that the contact had had implications within their own families and with partners as well as with their own children. The implications were reported as being challenging for many of the respondents. This is understandable in that the boundaries which had existed for the donor’s family were now having to be modified and extended to incorporate the offspring and his/her family. Some donors reported that their family members were uncomfortable about such changes and saw them as a threat to the established rela-
tionships/boundaries. This would again seem to suggest that it is almost impossible to take an individualistic view of the donor. Even if he is single, he is, after all, a part of an established set of relationships and these are highly likely to be impacted by his contact with offspring and their families. As Purdie et al. (1994) have pointed out, 'a man is a sperm donor for only a short time; after that he becomes a man with children in someone else's family'.

For a donor with his own family, it may be helpful to think of two families engaging with each other, rather than a donor and his offspring. In this evolving field of practice, it seems highly important that those seeking to make contact give careful consideration to the two families who will inevitably be linked through the donor and offspring. Exploration and clarification of the boundaries, expectations, changes, constraints, to cite the most obvious, would seem to be crucial for all the parties involved.

In conclusion, this paper gives voice to the views and experiences of 164 semen donors, almost all of whom are willing to have contact with the offspring they had helped to create. They are part of a growing trend (even a revolution) which sees increasing numbers of parents sharing the donor family history with their offspring, more of those offspring wanting information and/or contact with ‘their’ donor and with half-siblings, and more donors and their families being interested in contact with the offspring. This trend challenges the traditional view of the semen donor as one who makes a personal and private one-off contribution which begins and ends the transaction and his involvement. Gamete donation leads to a set of relationships and networks which extend well beyond the donor and the offspring. The research reported on this paper provides some insights to the views of these donors regarding their motivations for donating, the impact of their being a donor on their own family and their actual or potential contact with ‘their’ offspring.

The paper contributes to the understanding of donors and their families perspectives regarding contact with offspring. It is hoped that this understanding will, in turn, contribute to discussion amongst professionals and others about how they can contribute to the preparation for and management of contact between the involved parties.

References


Daniels, K., Blyth, E., Crawshaw, M., Curson, R., 2005. Short communication: previous semen donors and their views regarding the sharing of information with offspring. Hum. Reprod. 20, 1670–1675.


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