The Science of Medicine

Dominik Wujastyk

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The beginnings of medical science

Indian medicine, as a systematic and scholarly tradition, begins historically with the appearance of the great medical encyclopedias of Caraka, Suśruta and Bhela about two thousand years ago.[1] These are the oldest Indian medical texts we have, and also the most influential. Just as Pāṇini's famous linguistic study of Sanskrit leaps into the historical record fully formed, like the Buddha from Queen Maya's side, so the medical encyclopedias too emerge with a learned medical tradition in an almost fully articulated form.

The antecedents

In the case of Pāṇini, we do have some preceding literature, which shows us traditional Indian linguistics in its childhood, so to speak, notably the *Nirukta* of Yāska, as well as the various *śikṣā* and *prātiśākhya* texts. But in the case of medicine far less precursory material has survived. Early medical texts which are now known only by name include the *Jatūkarṇatantra*, the *Hārītasaṃhitā*, the *Parāśarasaṃhitā*, and the *Kharanādasaṃhitā*, all of which apparently existed at the time of Śivadāsa who commented on the *Carakasaṃhitā* in the fifteenth century. Other lost works include the *Viśvāmitrasaṃhitā*, the *Atrisaṃhitā*, the *Kapilatantra*, and the *Gautamatantra* (Roy 1986: 157–9 and Meulenbeld 1999–2000: Ia.145–79, 369–71, 689–99). But even before these specialist treatises on medicine, there is a certain amount of material on the history of medicine which can be recovered from earlier, chiefly religious, texts.

Medicine in Vedic times

It is often claimed that āyurveda evolved organically from the medical traditions discernible in Vedic literature. The respected scholar Mira Roy, for example, draws attention to several areas of apparent continuity between the Vedic concepts, especially from the *Atharvaveda*, and the āyurvedic compendia (1986: 6.155 f). One of the examples she cites is the fact that five vital breaths are mentioned in both the *Atharvaveda* and the *Carakasaṃhitā* (AV 10.2.13, Ca.sū.12.8);

But on closer examination, all of these supposed parallels break down. Thus, it is true that Caraka's *Compendium* does have a discourse on the five vital breaths. This discourse is put into the mouth of a scholar called

[1] Abbreviations used in this paper: Ah. = *Aṣṭāṅgahṛdayasaṃhitā* (Kuṃṭe *et al.* 1995), Ca. = *Carakasaṃhitā* (Ācārya 1981), Su. = *Suśrutasaṃhitā* (Ācārya 1992). All translations are my own unless otherwise stated.

Vāyorvida ('he who knows about air'), who presents his theory as a cornerstone of physiology. As soon as he finishes his description, another scholar, Marīci, disputes his statement impatiently, saying (Ca.sū.12.9):

> Even if this is so, what is its general relevance to the purpose of this discussion or with knowledge of medical science? This is a discussion on the subject of medical science!

Vāyorvida tries to defend his point of view briefly, but without introducing any new ideas, and Mārica proceeds to put forward his own view that fire (*agni*) is the cornerstone of medicine. This too is superseded by the sage Kāpya with yet another view that *soma* is the cornerstone, and so the discussion continues. The conclusion presented by the chairman of the debate, Punarvasu Ātreya, is that while he regrets contradicting anyone, health ultimately comes down to a balance of the three humours (*doṣas*) (Ca.sū.12.13).

All we can really deduce from these passages is that a doctrine of five breaths existed at the time of the composition of the medical encyclopedias. Of course this is well known: the five breaths are already discussed in the much earlier literature of the Upaniṣads and Brāhmaṇas. But although the doctrine of the breaths is mentioned in the early medical texts, it does not become an important part of medical thought or practice until the composition of a much later work called the *Āyurvedasūtra*. This synthetic work, probably written in the early seventeenth century, tries for the first time to combine doctrines from āyurveda and a form of tantric yoga (Meulenbeld 1999–2000: IIa.499 ff.).

Roy herself finally concludes that in spite of some superficial similarities,

> Āyurveda, which incorporates different traditions [from the Veda], has a distinct place alongside of the Vedas. ... Although glorified as an appendage of Vedic literature, Āyurveda as such is not mentioned there (1986: 6.156).

Roy points out that although a later Vedic text, the *Ṛgvedaprātiśākhya* (16.54), refers to a medical treatise called *Good Medicine* (*subheṣaja*), it is the *Mahābhārata* that first refers to medicine as a science of eight parts (*cikitsāyāṃ aṣṭāṅgāyāṃ* 2.50.80), and uses the word 'āyurveda' as the name of the science of medicine (12.28.44, 12.328.9, 12.330.22).

The *Compendium* of Caraka contains a passage in which the physician is advised on how to respond, when pressed by questioners on the subject of which Veda his science belongs to (Ca.sū.30.21). He should answer that he is devoted to the *Atharvaveda* because that Veda prescribes rituals and

prayers to enhance and prolong life, and this is the purpose of medicine too. The context suggests that this passage should be read as a slightly knowing suggestion, in which the physician is being advised to claim allegiance to a Veda because his interlocutor requires it of him, and as part of a didactic strategy, rather than for any more fundamental reason connected with real historical connections. It is tempting to read Roy's arguments above, and others like them, as adhering to exactly this ancient recommendation.

If āyurveda does not derive from Vedic medical traditions, what then are its antecedents?

This has been one of the most outstanding problems for the history of āyurveda for most of the last century. One serious suggestion which has recurred in the literature on āyurvedic history is that some of the the innovative doctrines of āyurveda were taken from Greek physicians in Gandhāra. Jean Filliozat tested this idea in his book on classical Indian medicine, and indeed found some parallels between Indian and Greek thought, especially regarding the doctrines of breath (Skt. *prāṇa*, Grk. *pneuma*) (Filliozat 1964). But the general picture is that while Greek and Indian medicine traditions contain suggestive similarities, there is no evidence that either tradition borrowed directly from the other. Indian medical literature has no loan-words from Greek, and is in this respect quite different from the Indian astral sciences (*jyotiḥśāstra*) which have borrowed many items of Greek vocabulary. There are philologically puzzling words in āyurveda, for example *jentāka*, meaning a steam bath or sauna. This is almost certainly not a Sanskrit word in origin, but it is not from the Greek either, and its origin has not yet been traced. In fact, Michio Yano has, as reported elsewhere in this volume, discovered one Greek word in the early Sanskrit medical corpus. The word *horā* (ὥρα) occurs in Suśruta's *Compendium* (Su.sū.32.4) in a passage listing omens which foretell the death of a patient. If the patient's zodiacal sign (*horā*) has burning lights or meteors in it, the patient is doomed. This proves that the compiler of this part of the text was already aware of the Hellenistic astrology that became available in India during the second century CE. But this makes it even more striking that not one Greek loanword for a medical term appears in Sanskrit medical literature. Indian physicians almost certainly had the opportunity to imbibe Greek medical ideas, but apparently no motive.

Until recently, few other serious ideas had been mooted for the origin of āyurveda. The conjecture that āyurveda embodies traditions that somehow came from the Indus valley civilization is tempting, of course, but impossible to establish. Scholars working within a traditional framework have tended not to engage with the problem, because of the strong belief that āyurveda is indeed a continuation of medicine from the Vedic

saṃhitās. Many texts on the history of āyurveda, even written by contemporary scholars, start by repeating the mythological accounts given in the beginning of the saṃhitās in which medicine is passed from the gods to the humans through a chain of divine beings and spiritual teachers. Such scholars seem unable or unwilling to see such an account for what it is, a common frame for initiating any orthodox śāstra, which occurs in variant forms at the beginning of a number of other major texts, such as the *Bṛhajjātaka*, and in various places in purāṇic literature (Pollock 1985; Zysk 1999).

Accounts of origins cast as historical discourses can be considered as having two dimensions: a horizontal and a vertical, rather as de Saussure divided linguistic study into orthogonal diachronic and synchronic dimensions. The horizontal dimension is that of mundane time: history in this dimension is a narrative of the events of past times. The vertical dimension measures closeness to God: the history of this dimension is the account of how the present manifest situation has evolved, or descended, from an original, pristine world of absolute unity. When at the start of a Sanskrit text we are told by the author, as so often happens, that the work once consisted of millions of verses, but was handed from the original omniscient sages to human scholars only in abbreviated form, we must understand that we are dealing with vertical history. This is the story of how knowledge—which is essentially of God—has come to us mere mortals. Such a spiritual narrative is not to be confused or conflated with horizontal history, although the narrative may be cast in the language of past tenses and linear teacher-pupil descent. What we are being told is how the present work is an imperfect reflection of divine omniscience, a mirror—and many Sanskrit texts are called 'Mirrors' of this or that subject—of what is known in heaven. So when, at the start of the foundational texts of Sanskrit medicine, we are told of the passage of medical knowledge from the gods to ancient sages such as Dhanvantari and Ātreya, and thence to other humans such as Agniveśa and Suśruta, to Caraka and Nāgārjuna, we do not necessarily need to try to grasp all these figures as historical personages in the horizontal dimension. We are in the presence, rather, of a kind of *apologia*, an explanation of how something which was (past tense!) perfect, is now presented, brought into the present, in the blemished, mundane form of a textbook. It is an account of how knowledge which was once privileged is now commonly accessible.

It was Debiprasad Chattopadhyaya who first began to grapple with the sociology of Indian medical history, in his fascinating book *Science and society in ancient India* (Calcutta, 1977). In that text he presented strong arguments for considering the early medical encyclopedias to be non-religious,

empirically oriented works which had undergone a secondary process of 'Hinduization,' in order to make them into works acceptable to a Hindu brahmin elite. Chattopadhyaya, writing from a Communist perspective on Indian history, had his own motivations for discovering materialist and empirical traditions wherever possible in Indian intellectual history, and this probably biased many readers against accepting his conclusions about the history of Indian medicine. In the case of āyurveda, however, there is much to commend his arguments. But even Chattopadhyaya was not able to suggest where this empirical tradition came from.

Medicine in the Buddhist community

Evidence for the beginnings of a systematic science of medicine in India appears first in the literature of the earliest Buddhists, with many medical tales being recounted in the *Tripiṭaka*. The Buddha instructed his monks to care for each other in sickness, since they had abandoned the social structures which would have provided them with treatment if they had not left their families to become monks.

> You, O bhikkhus, have neither a mother nor a father who could nurse you. If, O bhikkhus, you do not nurse one another, who, then, will nurse you? Whoever, O bhikkhus, would nurse me, he should nurse the sick (*Mahāvagga* 8.26.3, cited in Zysk 1998: 41).

The earliest Buddhist monks seem to have concentrated on providing medical help only for each other, but before long the lay community started to request help from the monks. Zysk (1998) has collected evidence to show that early Buddhist monasteries included infirmaries and had standing instructions to aid all those who were sick, not only monks.

Buddhist monks thus seem to have taken an active attitude to their own health and that of their lay supporters. This attitude may have been encouraged by the many medical epithets and turns of phrase attributed to the Buddha in the recorded sermons. In his parables he often used images such as 'removing the arrows of suffering'. One of the forms in which the Buddha has been revered since at least the first century CE is as the 'Medicine Buddha' (*bhaiṣajyaguru*), and there is even a sūtra devoted to him under this name (Zysk 1998: 62).

Zysk's research into the medical materials recoverable from the Buddhist canon has revealed close similarities with the classical Sanskrit sources on medicine. It now seems almost certain that the foundations of classical āyurveda were being laid at the time of early Buddhism in the Buddhist and other ascetic communities.

In the centuries of Buddhist missionary expansion, Indian medical doctrines were carried across the Himalayas into Central Asia and beyond, as well as into Sri Lanka. The rare manuscripts that have survived from this diaspora, such as the Bower Manuscripts, share a common character: they are practical handbooks, manuals listing ailments and explaining the herbs and compounds that should be administered to cure them (Wujastyk 2001: ch. 4). There is little theory, little explanation, little philosophy. In this they differ from the classical compendia of āyurveda.

It is also possible that some important authors of Sanskrit medical texts, such as the famous Vāgbhaṭa, were Buddhists.

The medical body

The medical system which evolved from this ascetic milieu contained a sophisticated set of doctrines, supported by close observation and long experience of treating patients.

The body to which Indian medicine addresses itself is the physical body as understood to the senses and to empirical examination. In particular, āyurveda knows no *cakras*, nor the spinal conduits of breath (*prāṇa*) known from tantric literature. The concept of the *cakras* has today entered public consciousness world-wide, and is widely viewed as an ancient and immutable element of the Indian world view. This view needs to be qualified in two directions. First, the idea of the *cakras* is a relatively recent development in Indian tantric thought. It is datable only to the tenth century CE, making its appearance in texts such as the *Kubjikāmatatantra* and the *Mālinīvijayottaratantra* (Heilijgers-Seelen 1990). Secondly, the *cakras* make no appearance whatsoever in āyurveda. Notwithstanding the contemporary growth of various forms of massage and therapy focussed on the *cakras*, there is no such theme in the classical Sanskrit literature on medicine. The *cakras* really are an idea specific to *tantra* and yoga , and it is not until relatively recent times that this idea has been synthesized with medical thought and practice.

With a customary Indian interest in itemization (Smith 1994), the āyurvedic literature is keen to enumerate the receptacles, ligatures, conduits, orifices, and tissues which can be found in the human body. The *Śārṅgadharasaṃhitā* (ca. 1300) offers a fairly standard and clearly-presented version of such a list (Wujastyk 2001: 322–28). There are: seven receptacles (*āśaya*); seven body tissues (*dhātu*); seven impurities of the body tissues (*dhātumala*); seven subsidiary body tissues (*upadhātu*); seven membranes (*tvac*); three humours (*doṣa*); 900 sinews (*snāyu*); 210 ligaments (*sandhi*); 300 bones (*asthi*); 107 lethal points (*marman*); 700 ducts

(*sirā*); 24 pipes (*dhamanī*); 500 muscles (*māṃsapeśī*); 20 extra ones for women; sixteen tendons (*kaṇḍarā*); ten orifices of the male body; thirteen orifices of the female body. Although these items may not in all cases be organs in the modern biomedical sense (Zimmermann 1983), there is a definite sense that āyurveda views the body as a locus of medical organs and processes which would be recognisable, at least in general terms, to a modern anatomist. After making his own much earlier enumeration of anatomical parts, Caraka noted, perhaps wistfully, that (Ca.śā.7.17),

> The parts of the body cannot, however, be counted because they are divided into tiny atoms (*paramāṇu*), and these are too numerous, too minute, and beyond perception. The cause of the conjunction and separation of these tiny atoms is wind (*vāyu*) and an innate disposition to action (*karmasvabhāva*).

This demonstrates an acute sense of the limits of possible scientific investigation, but at the same time contains fascinating and plausible suggestions about the nature of these 'tiny atoms'. Throughout medical and scientific discourse in Sanskrit, 'wind' often appears in contexts which would, in early European scientific discourse, require the word 'force'.

The metabolic process

The central process of the body is digestion. The Sanskrit words for the processes of digestion (*pācana*, *dīpana*) all imply 'cooking' or 'burning'. And the digestive force itself is simply called the 'fire' (*agni*), or 'fire in the belly' (*jāṭharāgni*). Once food has been eaten and cooked by this digestive fire, it turns into the first of the seven 'body tissues' (*dhātu*), namely chyme or chyle (*rasa*), the pulpy juice to which food is reduced in the stomach. Then the other principle of heat in the body, choler (*pitta*), goes to work and the chyle is transformed into the next body tissue in the chain, blood. Blood transforms into flesh, and similarly the remaining tissues, fat, bone, and marrow, are converted one into the next, until the seventh and highest essence of the body is generated: semen. This, of course, suggests a purely male view of the body, and āyurveda's picture of women's metabolism includes no obvious equivalent to semen: the evolution of the chain of body tissues does not seem to fit the substances in a woman's body. One passage in Suśruta's *Compendium* locates menstrual blood in the place of semen; another seems to suggest a certain degree of homology between male semen and female breast-milk. Yet another passage suggests that two women having intercourse may 'somehow' (*kathaṃcana*) produce semen (Su.ni.10.18–23ab, Su.śā.2.47). Āyurveda understands conception as the

union of male semen and female menstrual blood (there is no concept of 'ovum') . It is the woman's blood discharged during menstruation, but retained during pregnancy (when it is transformed into breast-milk), which joins with male semen and goes towards building a child's body.

Suśruta's *Compendium* gives the time scale for this principle metabolic process (Su.sū.14.10–16). The nutritive juice (*rasa*) spends about one hundred and eight hours in each of the body tissues. Thus, it takes a lunar month for the nutritive juice to become semen, or menstrual blood. The total time spent in metabolizing is six hundred and forty-eight hours. In a curious and interesting verse, Suśruta notes that, "This nutritive juice (*rasa*) flows throughout the whole body like a tiny particle, in a manner similar to the propagation of sound, light, and water.[2] " However, this is not the normal āyurvedic conception of how fluids are transported around the body. How then is the irrigation of the body—a metaphor used by Suśruta—carried out?

Fluids and their conduits

The types of fluid in the āyurvedic body include blood (*rakta*), milk, semen, breath (*prāṇa*), the the juice of digested food (*rasa*), and the humours wind (*vāta*), bile (*pitta*), and phlegm (*kapha*).

These fluids are transported from place to place by three principle types of conduit: ducts (*sirā*), pipes (*dhamanī*), and tubes (*srotas*). Given the importance of this system of fluid distribution to the āyurvedic physiology, surprisingly little work has been done on clarifying what these conduits do, and how they are explained in āyurvedic theory (exceptions include Dasgupta 1969: ii.13 and Kutumbiah 1999: ch. 2).

Ducts (sirā)

According to the *Suśrutasaṃhitā*, the function of the 700 ducts is to carry wind, bile, phlegm and blood around the body, starting from their origin in the navel. In a vivid pair of metaphors, one agricultural and one botanical, Suśruta's text describes the ducts as follows (Su.śā.7.3):

> As a garden or a field is irrigated by water-carrying canals, and each part receives nourishment, so the ducts provide nutrition to the body by means of their contraction and dilation. Their branches are just like the veins on a leaf.

[2] Su.sū.14.16: *sa śabdārcirjalasantānavad aṇunā viśeṣeṇānudhāvaty evaṃ śarīraṃ kevalam*.

A point of special interest is that the ducts are coloured according to what they carry: those carrying wind are yellowish brown (*aruṇa*), those carrying bile are dark blue, those carrying phlegm are white, and those carrying blood are red (Su.śā.7.18). It seems likely that these distinctions are based on the observation of different-coloured vessels under the surface of the skin. In yet another simile, Suśruta likens the distribution of these ducts from the umbilical centre through the body to the spokes radiating from the centre of a wheel (Su.śā.7.7).

Pipes (dhamanī)

There are said to be twenty-four pipes in the body (Su.śā.9). Like the ducts, they originate in the navel. From there, ten go up, ten down, and four sideways.

Those which go up from the navel support the body by carrying particular items (*viśeṣa*) such as sound, touch, vision, taste, smell, out-breath (*praśvāsa*), in-breath (*ucchvāsa*), yawning, sneezing, laughter, speech, crying, etc. These ten pipes go from the navel to the heart and there each one divides into three branches, thus producing thirty pipes. Ten of these are devoted to carrying the humours, wind, bile, and phlegm, as well as blood and nutritive fluid (two pipes for each substance). Eight more carry sense impressions: sound, form, taste, and smell (again, two pipes each). Two pipes are used for speech (*bhāṣā*), two for making sound (*ghoṣa*), two for sleeping, and two more for waking up. Two pipes carry tears. Two pipes connected to the breasts carry women's breast-milk; curiously, in men the same two pipes are said to carry semen from the breasts.

Those pipes which go down from the navel carry substances such as wind, urine, faeces, semen, and menstrual blood. In between the receptacles of raw and digested food, the pipes divide into three branches, as before. The first ten pipes have the same functions as the first ten upward pipes. The next two carry food to the intestines, and another two carry water. Two carry urine to the bladder. Two generate and transport semen, and two make it ejaculate. In women, the same four pipes carry and discharge menstrual blood. Two pipes are connected to the intestines and function in defecation. The remaining eight pipes supply sweat to the horizontal pipes.

The four pipes which run sideways are said to subdivide hundreds of thousands of times, holding the body together in a network. Their ends are connected to the hair follicles, and through these sweat is carried out and nutritive juice is carried in. This is how massage oils, showers, and ointments can move through the skin and affect the body internally. They are also the means by which pleasant and unpleasant sensations of touch are experienced.

Tubes (srotas)

According to Suśruta, there are initially twenty-two tubes in the body, two for each of eleven substances (Su.śā.9.12–13; cf. Ca.vi.5). Two of the tubes (*srotas*) carry breath (*prāṇa*), and are joined to the heart and the pipes (*dhamanī*) which carry nutritive juice. Two more carry food, and are joined to the food-carrying pipes and the stomach. Two carry water and are joined to the palate and the lung (*kloman*). Two carry nutritive juice and are joined to the same places as those carrying breath. Two carry blood, and are joined to the liver, the spleen, and the pipes which carry blood. Two carry flesh, and are joined to the ligaments, skin, and pipes which carry blood. Two carry fat and are joined to the waist (*kaṭī*) and the kidneys. Two carry urine and are joined to the bladder and penis. Two carry faeces and are joined to the receptacle of digested food and the rectum. Two carry semen and are joined to the breasts and testicles. Two carry menstrual blood and are joined to the womb and the pipes which carry menstrual blood. (There is no suggestion that these last pairs are specific to either gender.) Caraka adds three more categories of tube: two carrying bone, two carrying marrow (completing the set of seven basic body elements (*dhatu*)), and two carrying sweat. He omits menstrual blood. Like the horizontal pipes, the tubes in the body divide and subdivide into innumerable tiny branches.

In contrast to the ducts and pipes, the description of these tubes is embedded in a discourse of injury, and the symptoms arising from damage to them are listed.

Suśruta records the existence of an ancient disagreement amongst physicians as to whether the pipes, ducts and tubes are really separate types of vessel, and in particular whether there is a significant difference between pipes (*dhamanī*) and tubes (*srotas*). He argues that there is indeed a difference between these three types of vessel: they look different, have different connections, and different functions. The authoritative tradition of medical science also asserts their difference. It is merely because of their close proximity, similarity, and small size that they are conflated. Caraka also testifies to contemporary debates about the nature of these vessels; he records—and rejects—an extreme view that the human body consists only of a conglomeration of tubes.

Diagnosis

Another disagreement in the early medical tradition concerns the methods of diagnosis. Caraka uses the traditional scheme of the three 'epistemological standards' (*pramāṇa*) as the basis for his diagnostic scheme. Diseases

are discovered by means of the combined application of authoritative testimony, direct perception, and inference. The tradition of medical learning and science counts as authority. Direct perception means examining the patient using all the senses, although Caraka is distinctly squeamish about the sense of taste, and offers several ways of avoiding the need to taste the patient. Finally, inference is used to deduce the state of non-visible features of the patient's body and functioning.

Using a simpler approach, Suśruta first records the tradition that there are three methods a physician should use to examine a patient: touching, looking, and questioning. But he then argues that a doctor has five senses, and that he should use all of them when examining a patient. For some reason, this common-sense view did not prevail in later medical textbooks, nor did Caraka's complex system. Later medical tradition normally reproduces Suśruta's triple-examination method.

Pulse

Debate and questioning on the topic of diagnosis probably continued, for by the late fifteenth century a new set of diagnostic methods had emerged as standard, the 'examination of the eight bases' (*aṣṭasthānaparīkṣā*): pulse, urine, eyes, face, tongue, faeces, voice, and skin. These methods are first mentioned as a fixed set in the *Jvaratimirabhāskara* of the Mewari physician Cāmuṇḍa (fl. ca. 1474–1538; Meulenbeld 1999–2000: IIa.165), and become a standard in later medical textbooks.

The diagnosis of disease by pulse first appears in Sanskrit in the fourteenth-century *Compendium* of Śārṅgadhara (Wujastyk 2001: ch. 7). He begins by describing the pipe (*dhamanī*) on the hand at the base of the thumb as 'an indicator of life', and notes that an expert can tell the well-being or ill health of the body by its behaviour. He then connects various humoral conditions with different movements felt in the tube (*nāḍī*). Thus, inflamed wind feels like the movement of a leech or a snake; inflamed bile feels like the gait of a sparrow-hawk, crow or frog; inflamed phlegm feels like the gait of a swan or pigeon. The tube is also characterised as feeling weak or strong, cold or hot, firm or sluggish (Wujastyk 2001: 318).

In Śārṅgadhara's text, and until the advent of influences from European medicine, the understanding and use of pulse is closely tied to prognostication techniques. The ability to foretell the course of a patient's illness has formed a part of āyurvedic medicine from the earliest times. Caraka, for example, devotes a section of his *Compendium*, the *Indriyasthāna*, to the various signs by which a doctor can read the impending death of a patient. A patient who is about to die is called 'blossomed' (*puṣpita*), partly because

of the metaphor of a flower inevitably preceding a fruit, and partly because a dying person may produce unusual and unexpected smells, including the smell of various flowers. In looking for signs of death, the physician is advised to feel the patient's body for temperature, perspiration, and resilience. He should also look for changes in the breathing and in the pulsations at the nape of the neck (Ca.ni.3.6). Thus, when the examination of the pulse appears in āyurveda, it fits well into a preceding tradition of prognostication. In a medical tradition which does not know of the pumping function of the heart or of the circulation of the blood, one has to ask what the physicians thought they were feeling in the pulse (cf. Kuriyama 1999). The position of the first historical description of āyurvedic pulse lore, in Śārṅgadhara's text, immediately precedes his sections on the interpretation of omens and dreams. This context sheds important light on how this new diagnostic technique was understood.[3]

Disease aetiology

The question of disease aetiology in *āyurveda* is of great interest, and is far more sophisticated than the simple idea that 'disease is an imbalance of the humours', although this statement is certainly part of the classical tradition. One of the central etiological ideas in *āyurveda* is the 'abrogation of wisdom' (*prajñāparādha*), the idea that we fall ill through actions that follow lapses of judgement.[4] This 'judgement' (*prajñā*) consists of the combined work of three mental faculties: intelligence (*dhī*), will-power (*dhṛti*), and memory (*smṛti*).[5] As an example of impaired intelligence, the classical authors cite errors such as mistaking something permanent as temporary, or something harmful as helpful, etc. Poor will-power would be exemplified by a lack of self-control in the face of sensual enjoyments which are unhealthy. Faulty memory is exemplified when a person's mind becomes so confused by passion or darkness, that they cease to be able to see things as they really are, and they cannot remember what should be remembered. The concept of memory is expanded elsewhere in Caraka's *Compendium* into a full-blown doctrine of yogic self-remembering, strongly reminiscent of the Buddhist mindfulness (*sati*).[6] Erroneous mental processes are likely to lead a person to engage in several types of faulty action. The person may

[3] I am grateful to Anupam Goenka, with whom these ideas were discussed and developed (Goenka 2001).

[4] For accessible introductions to the concept of *prajñāparādha*, see Dasgupta (1969: II, 415–18 *et passim*), and Weiss (1980).

[5] Ca.śā.1.98–109.

[6] Ca.śā.1.137–155. Cf. Thera 1996.

misuse or abuse their senses, body, speech, or mind in various ways, and this abuse leads to sickness.

A related cause of illness is the suppression of natural urges. Urges related to urine or faeces, semen, wind, nausea, sneezing, clearing the throat, and yawning should always be obeyed, without hesitation. So should the urgings of hunger and thirst, tears, sleep, or the panting induced by exertion. The suppression of any of these natural urges can lead to disease and is another example of a lapse of good judgement. Of course, bad urges, such as to impetuous or dishonourable deeds, should be suppressed, and this applies also to extreme feelings of negative emotion, the vocal expression of hatred or criticism, or physical violence.

Yet another disease aetiology is the operation of karma: diseases afflict people due abrogations of their good judgement in the past. In the medical texts, the workings of karma are described in more detail than is usual. The karma one created oneself during a previous embodiment shows itself in the present as good or bad luck. Added to that is the further karma one creates in the present lifetime. These two kinds of karma may be graded according to strength or weakness: karma can be low, medium, or superior. A combination of the superior kinds of the two karma types gives rise to a long and happy lifetime. A combination of the low ones brings about a short and miserable life, and a combination of medium karmas is expected to result in an average lifespan.[7] The literature of 'the ripening of deeds' (*karmavipāka*) develops these ideas, sometimes in great detail, with personal case histories exemplifying diseases and their karmic antecedents (Pingree 1997; Wujastyk 1999).

Demonic interference and possession was viewed as another valid cause of illness. Women and children are particularly vulnerable to such possession, which is also often presented as a punishment for bad deeds (Wujastyk 1999). Disease contagion is not a standard feature of the āyurvedic understanding of how illness arises (Zysk 2000; Das 2000), but interestingly a form of spirit-contagion is described in Kāśyapa's *Compendium*, in which a demon (*graha*) which has taken up abode in one unfortunate person may be transferred to another by means of touch (Wujastyk 2001: ch. 5).

Therapy

Āyurveda recommends a wide range of therapeutic techniques, including herbal drugs, massage, sauna, exercise, diet (including the use of meat broths and other non-vegetarian tonics), blood-letting (including leeching),

[7] Ca.Vi.3.29.

psychotherapy, and surgery. One important group of five therapies (*pañca-karman*) became established early. According to Caraka, these were: emetics, purgation, two types of enema, and nasal catharsis. Suśruta replaced one of the enema treatments with bloodletting. Other authors introduced sweating and massage, as well as other therapies, into what became historically an increasingly important and elaborate complex of treatments.

Almost every other therapeutic application in āyurveda is preceded by a standard regime of oiling and sweating. 'Oiling' usually consists of taking oils or fats by mouth, often with food. But it can also consist of oil enemas, nasal drops, bodily anointing, gargling, or the application of oils to the head, eyes, or ears. 'Sweating' can mean warming the body by any of a range of methods: with a hot cloth, a warm metal plate, or the hands, the application of hot poultices, taking a traditional steam sauna, or the pouring of infusions of herbs and meats over the patient from a kettle. These preliminaries help to open the channels in the patient's body and to liquefy the humours which have been causing blockages, enabling them either to flow out of the body through the digestive tract, or to return to their proper locations in the body.

Surgery

The discussion of surgery in early āyurveda is most highly developed in the *Compendium* of Suśruta. There are many chapters here on such topics as the training of the surgeon, the preparation and maintenance of a wide range of scalpels, probes, pincers, and other surgical tools, and the diagnosis of medical problems which are to be treated specifically by surgery. Elaborate and varied surgical techniques are described, including perineal lithotomy, ophthalmological couching for cataract, the reduction of dislocations, the lancing of boils, the piercing of earlobes, the removal of obstructions and foreign bodies of all kinds from the flesh and orifices, rhinoplasty and the repair of harelip, and the suturing of wounds (Mukhopādhyāya 1913; Majno 1975; Wujastyk 2001: ch. 3). Suśruta's surgical chapters are justly famous. Why such an extraordinarily advanced school of surgery should have arisen so early in India, and why its work should have been recorded in Sanskrit, remain unanswered questions. The vibrant tradition evidenced by Suśruta's text did not survive as part of professional medical practice, although isolated techniques such as cataract couching did continue to be performed by barber-surgeons in a tradition apparently unsupported by a learned literature or formal training.

Materia medica

A large part of the āyurvedic literature, including general works, monographs, and dictionaries, is devoted to herbal medicine and materia medica generally. Several thousand plants are known and described in terms of a pharmacological typology based on flavourings (six types), potency (usually two: hot and cold), post-digestive flavourings (usually three), and pragmatic efficacy (used when the effect of a medicine is not adequately defined by the earlier categories). This typology is keyed to the system of humours and other physiological categories as expressed through the vocabulary of pathology. The system of humours functions in medicine in somewhat the same manner as the 'case function' (*kāraka*) system in Pāṇinian grammar. Just as the six case functions provide the grammarian with a set of categories though which the urge to express a meaning (*vivakṣā*) can be related to morphological units of grammar, so the three medical humours provide a set of mediating categories through which diseases can be related to herbal medicines.

Rules of interpretation

There are certain rules of interpretation (*paribhāṣā*) which are applied when using herbal medicines, and these exemplify the important notion of 'default values' which Frits Staal has highlighted elsewhere in this volume in the context of ritual and grammar. Thus, unless otherwise stated, the time of any action is dawn, the part of a plant is the root, the quantity of substances is equal, the container is made of clay, the liquid is water, and the oil is from sesame. By default, herbs should be fresh, not dried, and fresh herbs should be used in double the specified measure (Wujastyk 2001: ch. 7). There are many other standard defaults which are silently applied in medical situations, including a set of more than thirty subtle and interesting rules called 'the logic of the discipline' (*tantrayukti*) which are to be used when interpreting medical statements (Su.ut.65, Ca.si.12.41–48).[8]

Medical philosophy

Several modern authors have written about the interesting philosophical passages which occur in the early medical literature, especially in Caraka's *Compendium* (e.g., Dasgupta 1969: ii.13; Larson 1993). Caraka's use of Sāṃkhya and Vaiśeṣika concepts is of particular interest: his extensive treatment of the theory and practice of formal argument (Ca.vi.8) led

[8]These same rules also appear in the *Arthaśāstra*.

Dasgupta to argue that the medical literature preserved perhaps the earliest stratum of Nyāya thought. Less attention has been paid to Caraka's version of the Yoga system (Ca.śā.1 esp. 137 ff.). Comba (in press) has shown that this chapter of Caraka's work cites several passages from the *Vaiśeṣikasūtra*. For Caraka, yoga and liberation (*mokṣa*) are both states in which all sensations (*vedanā*) cease. In liberation, however, this cessation is complete, while in yoga it is a goal. Quoting from the *Vaiśeṣikasūtra*s, Caraka asserts that yoga arises when the mind is concentrated steadily on the self; in that state, the contact between the self and the sense organs, etc., ceases to exist, and several special powers arise. These are the standard eight siddhis of yoga and Indian magic. Caraka then focusses on the concept of mindfulness or remembering, in particular the memory of reality (*tattvasmṛti*), which both gives rise to a serious and soteriologically oriented lifestyle, and is produced by it. The full emergence of this special kind of memory (*smṛti*) results in freedom from suffering. At this point, Caraka presents his own unique eightfold path of yoga, which is quite different from the classical scheme of Patañjali. The path is aimed at developing memory, and consists of the following eight elements: understanding causes, forms (*nimittarūpagrahaṇa*), similarity (*sādṛśya*), and difference (*viparyaya*); adherence to purity (*sattvānubandha*), practice (*abhyāsa*), the yoga of knowledge (*jñānayoga*), and repeated listening (*punaḥśruta*). The mindfulness of reality (*tattvasmṛti*) produced by these eight practices leads to the identification of the self with brahman.

The wider influence of āyurveda

Classical Indian medicine, āyurveda, has exerted a long and pervasive influence on other indigenous traditions in India, as well as on those of foreign countries. The fields of dharmaśāstra, arthaśāstra, tantra, alchemy, kāmaśāstra, and other sciences were all influenced by āyurveda in varying degrees. Āyurvedic treatises, such as the toxicological tract which is embedded in Suśruta's *Kalpasthāna*, became famous in Arabic translations from a very early period (Wujastyk 2001: 123). The Tibetan translation movement from the eighth century onwards resulted in many āyurvedic works becoming an integral part of the Tibetan healing tradition, and āyuvedic manuscripts recovered from the oasis towns of the Taklamakan desert testify to its importance in Central Asia . The Persian *Kitāb Firdaws al-ḥikma* by ʿAlī ibn-Sahl aṭ-Ṭabarī, written in 850, included a detailed account of āyurveda, based on already existing Persian and Arabic translations of the āyurvedic classics. The great Muslim physician Muḥammad ibn-Zakariyyā' ar-Rāzī (d. 925) frequently cited Arabic translations of Caraka (Ullmann 1978: 19).

Later, through the works of da Orta (1563), van Rheede (1678–1703) and Linnaeus (1748, 1753), āyurvedic traditions exerted an important and lasting influence on the development of botanical science in Europe (Grove 1995: ch. 2l). During the twentieth century, āyurveda has been supported at the national level in post-independence India, with hospitals, colleges, clinics, and a thriving āyurvedic pharmaceutical industry. And a process of globalisation—similar to that which took place earlier with yoga—has begun to occur also with āyurveda. As might be expected, āyurveda 'in diaspora' is changing and adapting, as it moves from its pre-modern role as the only learned medicine available to the population to a new position as one part of a portfolio of alternative and complementary therapies offered alongside modern biomedicine.

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