

Clip: NEEDHAM JOSEPH_JOSEPH NEEDHAM WITH GREGG

**Name: NEEDHAM JOSEPH_JOSEPH NEEDHAM WITH
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S1 **00:00:42:11**

I have the pleasure today of being able to speak with Dr. Joseph Needham, the author of *Science and Civilization in China*, and a man regarded by many as one of Britain's leading intellectuals of the 20th century. His reputation is due to his having bridged the civilizations of China and Europe. It's also due to his having bridged the gap between what C.P. Snow referred to as the two cultures the natural sciences and the humanities. You were born in London in 1900, and you went up to Cambridge in 1918. Were there things that happened in your life before coming to Cambridge that I'm predisposed you to an interest in history?

S2 **00:01:27:23**

Well, 1917 was the important year of the Russian Revolution, wasn't it? It was indeed. And I remember very well upsetting my father by saying I thought it was a jolly good thing.

S1 **00:01:41:11**

Had you been reading Marx and Engels and you.

S2 **00:01:43:21**

Never read any of Marx and Engels at that time? It was. I'm sure now, looking back, it was entirely due to having read Bernard Shaw and H.G. Wells.

S1 **00:01:52:10**

I see. And I never.

S2 **00:01:54:06**

Met Bernard Shaw, but I knew Welles quite well afterwards.

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S1 **00:01:57:05**

Yes. You met Welles for the first time, I think, while you were at school. Arundel.

S2 **00:02:01:13**

That's right. That's right. We had a system of demonstrating things. Even if you were in the classical states and you had an interest in biology, you were allowed to demonstrate. Yes. And I remember demonstrating nucleated blood corpuscles to him. To Welles. Yes, I.

S1 **00:02:18:03**

See. And then you got to know him later on.

S2 **00:02:20:12**

Yes, that's right.

S1 **00:02:21:17**

How did that.

S2 **00:02:23:00**

Well, that's part of the world mind. And time and space was one of his typical typical pieces of writing. Pieces of writing?

S1 **00:02:32:19**

Yes.

S2 **00:02:33:05**

Yes. And there was a symposium based on it, which I contributed.

S1 **00:02:37:07**

Did did Wells's historical breadth influence you as well, to be interested in a broad view of history rather than a sort of narrow 50 years?

S2 **00:02:46:22**

You must have had an effect like that. Yes.

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S1 **00:02:49:19**

The political commitment continued. Well, I suppose grew after after your time in Cambridge or after your time as an undergraduate. And by the 1930s you were known as a very prominent left wing spokesman, especially on questions of science and social progress.

S2 **00:03:10:05**

Well, I hope so. Nice to hear you say, sir.

S1 **00:03:12:19**

Can you tell me a bit how that happens?

S2 **00:03:15:20**

Well, I don't know really. I don't know. It was a gradual process, I really think.

S1 **00:03:21:05**

Yes.

S2 **00:03:22:01**

But one of my chief convictions was that the kingdom of God on Earth was not a wild, impossible dream, but something that had the full authority of evolution behind it. Yes. And that was the typical contribution I think I had to make.

S1 **00:03:40:17**

So it was drawing on your Christian socialist roots and your scientific career. He the 1934 publication of History of Embryology, I think was built up on the basis of the introduction to your chemical embryology, the scientific one that was published in 1931, and also in 31. There was something that I think happened that was important. The second International History of Science. Congress was held in London.

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S2

00:04:16:13

Yes, it was. Okay. Then was the chief of the Russian delegation there? Yes. And Boris Hessen was the chief one who made an important influence on Western intellectuals. Boris hasn't demonstrated that Isaac Newton attached himself to the problems that he did because of the importance to the rising bourgeoisie which they represented, for example, in navigation. Yes. And other things.

S1

00:04:48:13

Yes.

S2

00:04:49:09

And this was regarded as really heretical by the older generation of internalized historians of science. Yes. But it had a great effect on people like Desmond Bernal and myself. Yes.

S1

00:05:04:16

And you came to represent the external point of view or to use an external point of view, in the writing and the teaching of the history of science that you then came to do?

S2

00:05:17:18

Yes, certainly. But I never had I never was a regular teacher of the history of science. I remained a biochemist. I was reader in biochemistry. So William Donne reader. And I never was part of the apparatus of the department of the History of History and Philosophy of Science and Cambridge.

S1

00:05:39:05

No, I think you remained, William. Done Reader of Biochemistry until 1966.

S2

00:05:44:09

That's quite right. Until I could get rid of it.

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S1 **00:05:47:07**

But that was the way you earned your bread and butter. Really?
Yes, that's right. Until you were elected Master of Teas in 66. But
I thought that in the 30s you were involved in the history of
organization, of history, of Science.

S2 **00:06:01:20**

Oh, very much so, yes.

S1 **00:06:03:22**

In Cambridge.

S2 **00:06:05:02**

Very much so, yes. I was the instigator of the first committee on
the subject.

S1 **00:06:11:10**

And Walter Pagel was also.

S2 **00:06:15:02**

When he was secretary. Yes.

S1 **00:06:17:10**

Was that a specifically externalized lecture series in the history
of science?

S2 **00:06:24:01**

It wasn't really We I remember the first series of lectures we held
was one in which all the great men like Eddington and people
like that gave lectures in it. Yes. And some of them were external
rather, and some were internal lists, but it didn't matter.

S1 **00:06:42:18**

Right?

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S2

00:06:42:24

And really, they were really saying what had happened in their sciences since the year 1900.

S1

00:06:49:12

And in the 30s, you also made an excursion, I believe, into social history in the late 30s with the booklet on the Levellers.

S2

00:06:58:06

Oh, yes. But I had to publish that under a fictitious name. Under a pen name.

S1

00:07:03:13

Could you tell me?

S2

00:07:04:02

I despaired. I despaired of getting into the Royal Society if I took an interest in things like that so far away from the natural sciences. And for that reason, I called myself Henry Holland. Sure. Yeah.

S1

00:07:16:23

In the late 30s, I believe, was the time when you made your first acquaintance with with Chinese scientists, or at least.

S2

00:07:27:03

That was in 1937. Yes. Yes, there were three of them came to Cambridge. Who were they at that time? Well, one was John who worked with me. Yes. And then the other another one was Wang Ly. Yes. Who worked with David Keeling of the Institute. And then there was Lou Gajanan, who joined Unesco after the war, after the war, and did nine years there and then finally came back to Cambridge and became a specialist in the history of biology and medicine.

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S1 **00:07:57:21**

Yes. Working with you on a project that I believe you knowingly conceived.

S2 **00:08:04:19**

We did. Really?

S1 **00:08:05:16**

Yes. When was that?

S2 **00:08:07:06**

Well, that was before she left for America in 1939 or thereabouts. Yes. And in 40, perhaps.

S1 **00:08:15:22**

Yes.

S2 **00:08:17:07**

We always sketched out the nature of the book. And then with Wong Ling wanting me afterwards, I sketched out more, more and more definitely the nature of the work.

S1 **00:08:32:12**

Now, can we go back a step and can I ask you about your any possible connection between your religious positions and your interest in Chinese civilization? Am I right in saying that in religious matters you are you were and are a sort of modernist?

S2 **00:08:54:12**

Well, I'm a modernist, all right, But I was an Anglican. Yes. And I said just now that I said just now that the Kingdom of God on Earth was not an impossible dream, but something that had the whole validity of evolutionary process behind it. And I still believe that, yes.

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S1

00:09:14:04

Perhaps quite a few people would find it strange that someone brought up very much in the Christian tradition, would be interested in other civilizations and other systems of belief. There's a there's a tradition in Christianity that holds that only Christianity is the truth. And this is the one faith and the others are somehow wrong or heretical. But that wasn't the tradition you were brought up with, is it?

S2

00:09:46:18

No, not at all. My father was greatly attracted to the Society of Friends at one time. Yes. And he never joined them. But he he was a physician in general practice when I was young. And what he did, he took me Sunday by Sunday to the Temple church in London and to listen to the sermons of Bishop Barnes, E.W. Barnes, who was afterwards Bishop of Birmingham. Yes. And he had a funny idea of sermons. He would they were really more like lectures. He would talk one day about my Mondays, and in another day he would talk about the mannequins. Yes.

S1

00:10:23:09

Moses or the mannequins? Yes.

S2

00:10:25:19

All the Gnostics or. Or the Zen Buddhists or anything? Yes. And the result was that you got a wonderful introduction to to philosophy of religion.

S1

00:10:38:13

Yes.

S2

00:10:39:04

And that's one reason why I. Never, never been. I never had to worry about the spooky element in religion.

S1

00:10:49:02

Because you had a rationalist approach.

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S2

00:10:50:20

A rationalist.

S1

00:10:51:10

Approach. Yes.

S2

00:10:52:17

And I think that's very important. And then I also learned from Rudolf Otto that there were five kinds of human experience. Yes, science and religion was one kind or two kinds, rather. But there was also history and philosophy and creative arts. And that was another thing. And the the point is that the religion centered on the sense of the holy. Yes. Doesn't mean knows, as he said in his book. Indeed, in a way, I'm only an Anglican now because my forefathers were. And I think it's much easier to understand the sense of the holy to appreciate it. Really. Yes. In that context and in some totally other context. Yes. I mean.

S1

00:11:44:15

Much easier.

S2

00:11:45:09

I mean much easier. Yes. There would be Buddhists. I mean, there would be Westerners who would take up Buddhism or Daoism, as I nearly did. Yes. But on the whole, I think it's easier to appreciate the sense of the holy in the light of one's own traditions. Yes. But I think that one of the most liberating effects on my life was when I went to China and found that millions and millions of people didn't see any need for the idea of a creative, benevolent creator deity. Yes. Yes. And I think this was very important because the Daoist none of them did the confusions out or didn't want to talk about creation in any way because they knew we could do nothing or whatever about it. Yes. And the Daoist had the Dao running through all things. Yes. The invisible order of nature, but not creator. And the Buddhists. After all, they had lots of gods, but no creator God. Yes.

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S1 **00:12:54:13**

Your your your favorable disposition to Chinese civilization was something that had grown out of your previous views. Was it the.

S2 **00:13:06:14**

Well, yes. And especially knowing the three people who came to Cambridge at that time. Yes. Because they raised in the most acute form the problem of why modern science had originated in Europe. Yes.

S1 **00:13:21:24**

It must have struck you after a while that there was that there was quite a large scientific and technical tradition in China.

S2 **00:13:30:09**

Oh, yes, undoubtedly it did.

S1 **00:13:32:02**

Was this while you were in China during the war?

S2 **00:13:35:05**

Well, that was that was an interesting point. You see the nature of the job of scientific counselor at the embassy was to go around everywhere where there was scientific work going on. Yes. Whether mathematicians or engineers or chemists or anything like that in.

S1 **00:13:57:16**

Non occupied.

S2 **00:13:58:08**

China. In non occupied China. Yes. Yes. And I therefore had the opportunity of sitting at the feet of many, many people who were extremely interested in the history of the science and their own culture.

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S1

00:14:12:01

Yes, I.

S2

00:14:12:20

See. And in that way I got a very good, very good orientation in what to read and what to buy, what books to read and what books to buy. And that was how it all began, really.

S1

00:14:27:15

And when you came back to Cambridge then in 48 and you started working on the the project. Yes. Did you have some leading questions that you were bringing to some questions, guiding questions that you wanted to ask in the in the series? You now knew you were going to write. Are you now working on. Right.

S2

00:14:45:21

Well, the great question and one that's been central to everything else is why modern science originated only in Europe. Yes. And everything else gives way to that, I think.

S1

00:14:55:23

Yes, there was a second one, I suppose, also, and that is why China was so fruitful for scientific and technical development. For how long?

S2

00:15:08:01

14 centuries, I would say. I would say it changed over in the in the 15th century. Yes.

S1

00:15:15:01

But before that, China, compared to other parts of the world, was.

S2

00:15:20:16

More more.

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S1

00:15:21:06

Effective, more effective in in scientific invention.

S2

00:15:25:20

In finding out about nature and using the results for human benefit.

S1

00:15:28:22

Yeah, many people would have thought before your work that science and technological development was something confined to the West.

S2

00:15:37:07

Oh, yes. But that's an absolute absurdity. I mean, it's been shown to be. Entirely off the mark? Yes.

S1

00:15:45:00

Did you get fed up with this with the sort of superiority complex that Western authors would have about science when you were starting off?

S2

00:15:54:05

Well, I was all about.

S1

00:15:57:19

The comparative approach you used. Seems to have involved bringing in people from different cultural backgrounds, that is, especially from China and from from Western traditions. Did you see this as a very important thing to do?

S2

00:16:13:22

Well, I always used to say that this work couldn't be done by Western Chinese alone. It needed collaboration. Really? Because you couldn't. No. No mind could hold in one compass the all the details required for it. Yes. For example, all the technical terms in Chinese bureaucracy. Yes. And the names of positions and so on. It couldn't be held in one mind.

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S1 **00:16:43:07**

Once again, on the question of methodology, I've often heard you say that you're rather a brass tacks man.

S2 **00:16:49:13**

Yes, that's quite right.

S1 **00:16:51:07**

Could you say a bit about what that means?

S2 **00:16:55:20**

Well, all it means, I think, is that some people are very much up in the air. And I like to keep my nose to the grindstone, as it were. Yes. And for example, take the case of the of the into conversion of rotary and longitudinal motion. I like to know exactly when and where different items in it appeared.

S1 **00:17:20:19**

Yes. And to speak precisely.

S2 **00:17:24:01**

Speak precisely is.

S1 **00:17:25:10**

Does this put you in the empiricist tradition, would you say?

S2 **00:17:29:15**

Well, I think so, yeah.

S1 **00:17:30:22**

The tradition.

S2 **00:17:32:11**

I think so, yes.

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S1 **00:17:35:20**

I've also heard you referred to as master of utter confusion.

S2 **00:17:42:19**

Well.

S1 **00:17:43:18**

What does that.

S2 **00:17:44:07**

Mean?

S1 **00:17:45:03**

That means what does it refer to?

S2 **00:17:50:22**

Isn't it the master of utter confusion? Well, it's because when we when you start any new subject, whether it's gunpowder or or myopic spectacles or anything like that, you find that the subject is absolutely full of mistranslations and misconceptions that have gone before people have gone before. And so it's like The New Yorker's Department of Utter confusion. And you have to you have to put them straight.

S1 **00:18:23:06**

Yes.

S2 **00:18:23:22**

And a great deal of each chapter is involved in putting things straight.

S1 **00:18:28:19**

You've talked about the ecumenical nature of science in some ways or in some places. Could could you say more about about what the ecumenical nature of science? Well, it.

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S2

00:18:44:08

Doesn't matter where a thing is discovered or a thing is invented, it immediately transcends all the boundaries of time and space and gets across to where it's needed.

S1

00:18:56:12

Yes. Yes. This is something that you've referred to, especially in regard to the spread of modern science. Yes, I think that modern science can be practiced by anybody, anybody around the world.

S2

00:19:11:08

Proper training.

S1

00:19:12:05

But you've made a distinction between traditional and modern science.

S2

00:19:16:09

Yes, I think that's very important. I think modern science might be defined as a mathematician of hypotheses about nature. Yes. And. And combined with relentless experiment experimentation to weed out hypotheses that can't be substantiated. Yes. Yes. And that really constitutes modern science. And the problem is why it didn't originate in the in the east, in China or India and why it came up in Europe alone.

S1

00:19:47:18

But before we get onto that, can can we talk about the characteristics of traditional science? How do you how do you see those?

S2

00:19:56:16

Well, I mean, it doesn't involve the mathematics of hypotheses about nature.

S1

00:20:01:21

No.

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S2 **00:20:02:14**

And experiments certainly did. Yes. The Greeks didn't experiment much. No, but the Chinese certainly did. They never would have got the glazes and wonderful porcelain and pottery that they made unless they'd been attending very carefully to the oxidizing or reducing atmospheres of the kilns. Yes. And the temperatures and so on. Yes. And there must have been lots of experiments there and probably not written down. Yes. But there.

S1 **00:20:35:05**

Was an experiment.

S2 **00:20:36:02**

In a way. Yes. An experimental tradition, I think. Certainly, yes.

S1 **00:20:39:21**

And was there something about you said that traditional sciences did have their theoretical structure, but they had theories of the medieval type, not of the modern type. That's right. What does that involve? Mathematician, I suppose, is one of the things.

S2 **00:21:03:04**

But. Well, I mean, if you if you talk about things in terms of yin and yang. Yes. Or the five elements or the six warps or whatever it is. Yes. You're not talking in modern terms. That's the way they argued. Yeah. If you find that if you find the blood of a crayfish is blue, then you say, oh, that's because it's under the Guo ping or something like that. Yes.

S1 **00:21:27:14**

And in terms of the aging or the.

S2 **00:21:29:10**

Aging, Yes.

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S1

00:21:30:19

It's so scientific communication would have been almost impossible.

S2

00:21:35:14

Yes, I think so. But of course, if you could demonstrate something value of something, Yes. Then it could travel. Yes. And I think that's how the magnetic compass traveled. Yes. Because some Chinese ship master was in in port in Indian and Indian or port or somewhere in Ceylon, in Colombo or something like that. Yes. And he would be next door to a European ship master and he could demonstrate the value of the magnetic compass. And then it would be adopted. Yes. As it.

S1

00:22:11:19

Was. So material techniques could travel.

S2

00:22:14:15

Yes, that's right. But much more easily than concepts.

S1

00:22:19:23

Yes, I suppose. Francis Bacon's famous three inventions. There was the compass that you mentioned. Yes. What were the other ones?

S2

00:22:29:17

Printing and paper and gunpowder.

S1

00:22:31:08

And gunpowder as well? Yes. But scientific? No.

S2

00:22:35:04

No. Star has been more important for humanity than me. Three. That's bacon and bacon as well. His actual words he didn't know anything about. He didn't know that. He hadn't the faintest idea they were all Chinese.

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S1

00:22:47:07

But of course, China did fall behind in science and technology as compared with the West.

S2

00:22:53:17

Well, I don't think it fell behind. I think it was overtaken by the approach of modern science and technology in the Western world. Yes. I don't think there was any falling back, but it was hopelessly overtaken.

S1

00:23:08:06

And I think you have some ideas about why the take off occurred in the West in the scientific.

S2

00:23:15:10

Well, I think I think that's due to I said the other day in writing something. Science Society.

S1

00:23:21:23

Yes. The journal Science and Society. Yes.

S2

00:23:24:19

In America. I said the other day that perhaps the most enduring legacy of Marx and Engels was the historical materialism. Yes. The idea that you should always ask in any given question, you should always ask what was the perception and economics behind certain development? Yes. And I think that's very important because I think it it works out in China in this way, that Chinese feudalism, if you look carefully at it, turns out to be bureaucratic feudalism, quite different, quite different from the military, aristocratic feudalism of Europe. Yes. And this was that was that seemed to be very strong with all those knights and armored clanking.

S1

00:24:13:12

About the military. Military aristocratic.

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S2 **00:24:16:00**

Yes.

S1 **00:24:16:15**

Yes, indeed.

S2 **00:24:17:04**

In fact, it was much weaker the less rational. Yes. The Chinese system.

S1 **00:24:22:20**

Much weaker in terms of. It's historical durability.

S2 **00:24:28:16**

Yes. Much weaker. After all, Chinese gunpowder blew it up. The castle walls came, came thundering down.

S1 **00:24:39:22**

Well, so the external approaches is important in understanding the the take off of Europe and the overtaking of China in the scientific domain.

S2 **00:24:52:02**

I think so.

S1 **00:24:55:07**

Can you say more about how you see the package deal of the of the Protestant Reformation and the rise of the bourgeoisie and the emergence of modern science?

S2 **00:25:07:00**

Well, I think that modern science comes up with the rise of the bourgeoisie. Yes.

S1 **00:25:13:06**

And is linked to it.

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S2

00:25:15:09

Is linked to it, really. And it's rather hard to say exactly why, but I always take it that if you had a merchant in the modern time in the in the Renaissance who wanted to sell oil, he needed the exact specifications of the material. He might buy a large quantity of oil from some Greek island that he would want to know the specific gravity of it and the refractive index and what it could be used for and all these different things. Yes. So that was a great spur to the natural sciences, I think. Yes.

S1

00:25:53:11

And what about the mass modernization of sciences? I suppose that.

S2

00:25:58:19

Was it was came about naturally.

S1

00:26:02:14

Paralleled with the rise of a post-war worldview. Yes, that's right. Capitalist worldview. One had very rich merchants in traditional China, of course.

S2

00:26:12:05

Certainly. Certainly. But they were always kept down. They were always looked askance at by the bureaucratic chiefs. Yes.

S1

00:26:20:11

And they didn't really have the opportunity, I suppose, to ally with the emperor and take over.

S2

00:26:27:01

No, no, not at all. No, I never did.

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S1

00:26:29:12

Take over functions as happened in modern Europe. Yes, that's right. So the the bureaucratic officials in traditional China managed to maintain their their form of order much better than the aristocratic military ones. Yes. In the West?

S2

00:26:50:03

Well, I think it is more rational because you might be the heir to an earldom, but you might turn out to be an absolute moron. Yes. And nevertheless, you'd have to inherit it because that was part of the part of the primogeniture of the West. Yes. But in China, you would be somebody who'd come through the examination system. Yes. And you'd be a noted intellectual. Yes.

S1

00:27:16:17

I suppose the Chinese was a much more cosmopolitan system in a certain way. It was centralized, certainly centralized. And it was much more based on the cultural tradition rather than upon military. That's right. That's right. Of course.

S2

00:27:32:06

I always remember sitting in a tea shop in Taiwan in Sichuan, together with the Australian Minister of Plenty, potentially an ambassador to Chongqing. Yes. And he said, well, looking at the way this village is medieval in character, with the drains running down the center of the village street and so on, yes, you could always expect a night and many times to come riding down the street any minute. Yes. And I said, Well, yes, yes and no, because it wouldn't be night. It would be a it would be a civilian high official and the outriders would be not men at arms, but people carrying placards during his titles and dignities.

S1

00:28:16:03

Quite, yes.

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S2

00:28:16:23

And it wasn't as if the main justification or guardianship of China wasn't forced like in all human societies, but it was very much more disguised than in Europe.

S1

00:28:30:05

It seems as though the best brains were creamed off in China into the bureaucracy.

S2

00:28:35:05

That's right. All through the ages.

S1

00:28:37:00

Now, those two types of Chinese philosophical thought, I think, which you focused on as important for the development of traditional science in China. One is philosophical Daoism and the other some neo Confucianism.

S2

00:28:54:17

Idea of the Dao you see is the order of nature. Yes. And they although they were religious people, they believed in gods and so on. Yes. Nevertheless, they were very anxious to study the order of nature, the way in which nature worked. Yes. And that made them scientists ipso facto.

S1

00:29:14:14

Were they interested in society as well?

S2

00:29:17:16

Oh, yes, they were, because their ideal of a society was one in which the Cox would. Private adjoining village and nobody would ever go there to see anything. It was a very, very. Circumscribed kind of society. Yes.

S1

00:29:37:16

But I suppose very different from the one the confusions were then putting forth as an idea.

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S2 **00:29:43:02**

Certainly. Certainly. But the near confusions were of the late 12th century. Yes. Were much more interested in science. And they they had quite a lot of influence in that direction.

S1 **00:30:06:00**

This must lead into the question you've asked sometimes about why modern science didn't develop, why it didn't develop in China when certain forms of thought seemed to be very close. Yes. To modern scientific forms of thought. And you find I think.

S2 **00:30:29:04**

The essential thing is the bureaucratic feudalism.

S1 **00:30:32:04**

So you think it was the social and economic circumstances?

S2 **00:30:35:19**

I do. Really? Yes.

S1 **00:30:36:22**

Yes, yes.

S2 **00:30:38:14**

But of course, it doesn't mean that because modern science grew up with capitalism, it doesn't mean that the present time. Only in capitalism can modern science being well done. Because look at the Russian emphasis on space research. Yes. And successes in it. And then in China, too, there have been many very excellent works like the centres of insulin in modern times.

S1 **00:31:08:14**

So this goes back to the point we made before about the communication of modern science.

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S3

00:31:15:02

Yes. Yes.

S2

00:31:17:07

Which can cross all the boundaries.

S1

00:31:19:21

Well, I'd like to thank you very much, Joseph, for talking with us today. It's, as usual, been marvellous having a conversation with you.

S2

00:31:31:14

Thank you very much. Thank you.